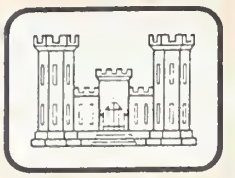
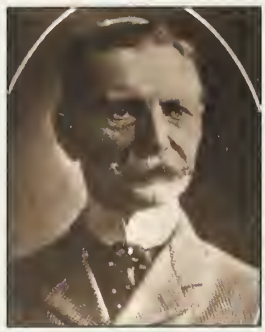
Castle on the Rock

The History of the Little Rock District U.S. Army Corps of Engineers

1881-1985

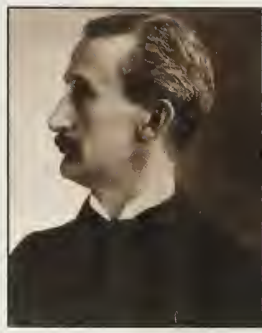


Capt. T.H. Handbury
1881-1883



Maj. M.B. Adams
1883-1884

Captain H.S. Taber
1884-1893



Captain C. F. Palfrey
1893-1894

Capt. G.D. Fitch
1901-1906

Capt. W.D. Connor
1906-1908

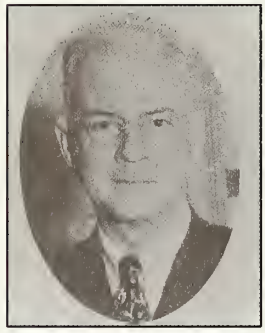
Capt. G.R. Lukesh
1908

Maj. M.L. Walker
1908-1910

Maj. C.S. Smith
1910-1912

Maj. R.P. Howell
1919-1920

Maj. J.N. Hodges
1920-1923



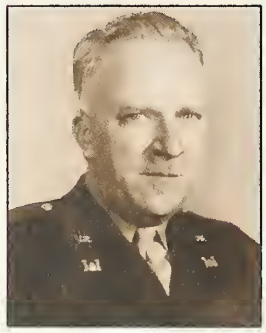
Maj. D. H. Connolly
1923-1928

Col. F.B. Wilby
1928-1931

Col. B.B. Somervell
1931-1933

Col. A.M. Neilson
1942-1943

Col. W.A. Davis, Jr
1944-1945



Col. R.D. Burdick
1945-1946

Col. G.E. Galloway
1946-1948

Col. T.A. Lane
1948-1950

Col. J.C. Dalrymple
1961-1962

Col. C.D. Maynard
1962-1965

Col. F.P. Bane
1965-1967

Col. C.L. Steel
1967-1970

Col. W.C. Burns
1970-1972

Lt. W. L. Sibert
1894-1898

Capt. H.C. Newcomer
1898-1899

Lt. Robert McGregor
1899-1901

Capt. C.L. Potter
1901

Maj. E. M. Markham
1912-1913, 1915

Capt. A.B. Putnam
1913-1915

Maj. E. J. Dent
1915-1917

Lt. Col. G.P. Howell
1917

P.R. Van Frank
1917-1919

Maj. W.M. Hoge
1933-1935

Lt. Col. Eugene Reybold
1935-1937

Lt. Col. Daniel Noce
1937

Lt. Col. S.L. Scott
1937-1940

Col. T.F. Kern
1940-1942

Col. H.W. Holmer
1950-1952

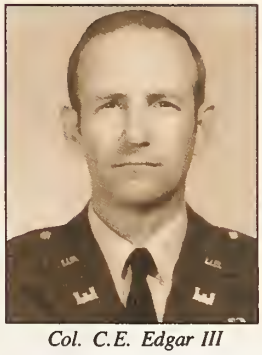
Col. T.J. Hayes III
1952-1953

Col. J.A. Clema
1953-1954

Col. S.L. Brown
1954-1958

Col. A.M. Jacoby
1958-1961

Col. D.G. Weinert
1972-1975



Col. C.E. Edgar III
1975-1978

Col. D.K. Randels
1978-1981

Lt. Col. L.S. Bonine
1981-1984

Col. R.W. Whitehead
1984-1987

Castle on the Rock

The History of the Little Rock District
U.S. Army Corps of Engineers

By
Mary Yeater Rahbourn

1881-1985

Little Rock, Arkansas 1990

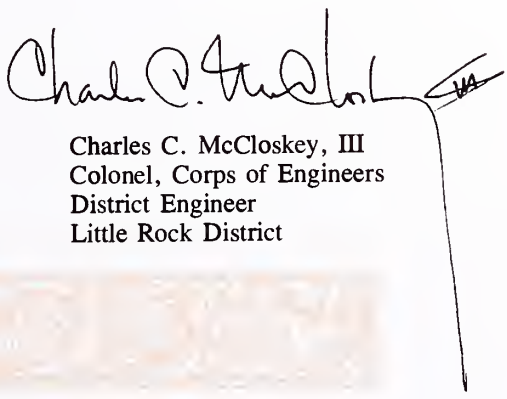
Foreword

At the publication of this history, the United States Army Corps of Engineers has completed over 165 years of continual service to the state of Arkansas. Occupying over half of Arkansas and portions of southern Missouri, the Little Rock District has played an important role in the history of the region. In the fifty years since the Little Rock District was re-established as a district office, the Corps has been a leader in regional economic development through its water resources projects and its military building program.

Construction of the McClellan-Kerr Arkansas River Navigation System has provided navigation across the entire state of Arkansas, and that project, along with the White River Basin lakes, has promoted greatly expanded economic opportunity for the entire area. The increasingly popular recreational areas of these projects have helped the region become one of the most popular vacation sites in the nation. Military construction completed by the Little Rock District throughout World War II and the postwar era has included Pine Bluff Arsenal, Camp Robinson, Camp (now Fort) Chaffee, prisoner of war camps, and several Air Force bases including Eaker (Blytheville) and Little Rock. This tradition of military construction continues today as Little Rock District is responsible for all military construction in the state of Arkansas.

The Little Rock District has served the nation well. It has built great dams for flood control; harnessed the Arkansas River and made it navigable; assisted the local citizens in times of emergency; generated hydroelectric power; and provided beautiful lakes and recreational areas.

This history is the story of a long line of dedicated public servants, men and women who have worked faithfully for the public good. This story is a record of their outstanding service and accomplishments to the Little Rock District and to the nation.



Charles C. McCloskey, III
Colonel, Corps of Engineers
District Engineer
Little Rock District

About the Author

Mary Yeater Rathbun is a partner of Rathbun Associates, a cultural resource services firm. The firm prepares historical and technical studies under contract with private individuals, businesses, organizations, private foundations, and government agencies. She is the author of many articles and monographs including several on the history of waterways. She co-authored a study of features of the Chicago harbor. Rathbun also wrote several pieces on the Illinois and Michigan Canal and the Hennepin Canal. She has completed histories of the Upper Mississippi River locks and dams for the Corps of Engineers and authored the Historic American Engineering Record documentation of these same locks and dams. Rathbun received her B.A. in history from Wells College in Aurora, New York. She completed her Masters in history at Boston College in Chestnut Hill, Massachusetts, where she also did her doctoral work in history. Prior to entering private practice, she taught history at Bently College in Waltham, Massachusetts, and the University of Dubuque in Iowa. Rathbun then worked as an historian and administrator for the Illinois Department of Conservation for a number of years. By 1983, when she joined Rathbun Associates full time, she had become the highest ranking natural and cultural resource administrator in Illinois to that time.

Preface

For more than 165 years, U.S. Army Engineers have been significantly enhancing the human environment in Arkansas and southern Missouri. They have applied engineering, scientific, and technological expertise to problems in the region, and activities of the Corps of Engineers have provided a major base for economic development. The Little Rock District has been the agency to accomplish much of this change.

A recurrent theme in the story of the Little Rock District is how the history of the region has reflected the fortunes of the Corps as a whole. This story has mirrored each expansion of the Corps' mission, functions, and responsibilities and each threat to the Corps' existence or its retention of specific functions. The tendency of the Army Engineers in this region to serve as prominent exemplars of national patterns gives continuity to this history and enhances its significance.

Historical perspective precludes viewing events, actions, people, or organizations in a vacuum. Rather, professional procedure demands analysis in historical context. Thus, the contributions and actions of the Army Engineers in the Little Rock District have been appraised in the context of the history of the Corps, of national water resources development, and of the region.

This is an official history of the U.S. Army Corps of Engineers, Little Rock District. Before Rathbun Associates began work on the project, District staff identified topics to be included. Under terms of the contract, other topics could be added and addressed by the author. The District's History Committee judged successive drafts of the manuscript for technical accuracy and writing style and made recommendations concerning matters of interpretation and organization. Committee members and other District staff worked closely with the author in revising portions of the manuscript.

The Office of History, Headquarters, U.S. Army Corps of Engineers in Fort Belvoir, Virginia, also reviewed the drafts, raising questions and making suggestions about interpretation. Staff members provided guidance on possible sources of information and reviewed manuscript organization, writing style, sources and references, and the bibliography.

Preliminary research for this history showed that Corps activities are often overlooked in standard regional histories and in general manuscript and archival collections. Therefore, the author relied heavily on other studies conducted under federal contract as well as Corps records and documents. Unfortunately, some Corps managers, unaware of their records' value, had destroyed files and internal office papers that would have been useful for this study. Many relevant records are available at the National Archives in Washington, D.C.; the National Records Center in Suitland, Maryland; the Federal Archives and Records Centers in Fort Worth, Texas, and in Kansas City, Missouri; and Corps offices in Little Rock, Dallas, Memphis, and Fort Belvoir, Virginia. Because these records contain mostly technical and engineering data, Rathbun Associates relied heavily on interviews with present and former District employees, Corps employees at the Southwestern Division headquarters, and individuals with special knowledge of the Corps and the District.

For the general reader, definitions of many specialized hydrological, construction, and engineering terms are included. These inclusions are an effort to provide descriptions of technical and engineering developments and activities in a way that will assist a reader with no technical or engineering background. Every effort has been made to assure the accuracy of the information, although in some cases highly technical subjects have been oversimplified.

Time constraints prevented exploration of all the events, activities, and themes that might have been included in this study. To produce a volume of manageable length with an even balance between the time periods covered, mention of many individuals and their contributions to the District were omitted.

A number of people helped in the completion of this book. Dave W. Vannoy joined Rathbun Associates at the beginning of this project. His first assignments involved research in Washington, D.C., Memphis, Dallas, and Fort Worth. He served as a general research assistant throughout the two-year project. Mr. Vannoy also wrote biographies of the District military leaders and the distinguished civilian employees contained in Appendixes I and II. Peter A. Rathbun edited the whole text and the appendixes and provided research assistance. More importantly, he served as an informed and intelligent sounding board. His counsel, sense of history, and insistence on high professional standards in research and writing contributed immeasurably to this book.

The word processing for this book was done by Anna K. Jansen, owner and operator of Letter Perfect in Springfield, Illinois, during the first year of the project, and by Chris F. Hegland, administrative assistant at Rathbun Associates' Sandy Rock Research Center in Hollandale, Wisconsin, during the second year. Both performed extraordinary editorial and research functions.

Another Rathbun Associates employee, Charles Hill, did supplemental editing on Appendixes I and II.

Current and past Little Rock District personnel contributed to the project. Colonel R.W. "Wayne" Whitehead took a particular interest in this project, and his Deputy District Engineers, Major Jerome B. Sidio and Lieutenant Colonel Marvin D. Thompson, served as contracting officers. The District's History Committee was directly and actively involved with the production and review of the manuscript. Special thanks are due Laura Brantley, District fisheries biologist, who served as author contact in the District. She provided access to people and additional information sources, scheduled project work, and served as liaison with the History Committee during the first year of the project. She was succeeded in the second year by Judy Bullwinkle, District librarian, who guided the manuscript to completion, paced project progress, and provided substantial research assistance. Robert Dunn, District archaeologist, served as the District's unofficial historian for this project. He gave freely of his profes-

sional understanding of historical research, his counsel, and his editorial support and served as a further liaison with the History Committee. Ada Devine of the District's Records Management Office was particularly helpful in locating materials and providing research facilities at District headquarters.

So many current and former District employees took time to answer questions and help educate that they cannot be named here. All individual interviews, including those with former District Engineers, are listed in the bibliography. These interviewees deserve a special "Thank you."

Southwestern Division staff were also helpful. Special recognition is due Major General Jerome B. Hilmes, Edgar A. Hoff, and Edward Nelson, all in Dallas.

Dr. Paul K. Walker and Dr. Janet McDonnell of the Headquarters, U.S. Army Corps of Engineers' Office of History assisted with this project. McDonnell's comments were particularly useful.

Dr. John Belshe and Dr. Fred Buchman of the Environmental Branch of the Chief of Engineer's Office and Penny Crumpler of the Chief Engineers' Library also assisted. Jacque Patterson also helped, as did Kathryn Hayes at the St. Louis District Library.

Sharon Dapalito of the Association of Graduates of West Point provided help. Staffs of the National Archives; the Federal Records Centers in Suitland, Maryland, Fort Worth, Texas, and Kansas City, Missouri; the Little Rock Public Library; the Arkansas Historical Commission; the University of Arkansas-Little Rock Archives; the Riely Library at Ouachita Baptist University; the State Historical Society of Missouri in Columbia; the Missouri State Historical Society in St. Louis; the Missouri State Library in Jefferson City; the State Historical Society of Wisconsin Library; the Illinois State Historical Society Library; the Illinois State Library; and the Lincoln Library in Springfield, Illinois, also assisted.

Discussions with and knowledge shared by Dr. D. Clayton Brown, author of the new Southwestern Division History, and Dr. Raymond Merrit, author of a 1980 history of the St. Paul District, were useful.

Special, further "Thanks" are due Chris Hegland, David Vannoy, and Peter Rathbun, who shared the Sandy Rock Research Center with the author during most of this project. Their support, patience, encouragement, and assistance were invaluable as was their willingness to adjust their work schedules to accommodate the project. The understanding of their families is also appreciated.

Finally, I dedicate this book to my husband, Peter, and my son, Michael, who have lived with me during the whole grumpy process of research and writing. Their forebearance, support, and encouragement are all that kept me going during much of the project. My thanks to them are endless.

15 June 1987 Mary Yeater Rathbun

Contents

Chapter		Page
I.	THE GEOGRAPHY OF THE REGION AND ITS EARLY HISTORY	1
II.	THE ORIGINS OF THE DISTRICT, 1820-1881	11
III.	IMPROVEMENTS IN THE ARKANSAS AND WHITE RIVER BASINS, 1881-1898	25
IV.	A NEW ATTITUDE TOWARD WATER RESOURCES, 1898-1921	35
V.	ORIGINS OF THE REACTIVATED DISTRICT, 1921-1937	45
VI.	REACTIVATION OF THE DISTRICT, 1937-1945	55
VII.	RE-EMERGENCE OF CIVIL WORKS AS THE DOMINANT ACTIVITY IN THE DISTRICT, 1946-1968	67
VIII.	RENAISSANCE OF THE RIVER, 1945-1971	81
IX.	THE EMPHASIS SHIFTS, 1969-1985	95
X.	CONCLUSION	107

Appendixes		Page
I.	THE MILITARY LEADERSHIP	109
II.	DISTINGUISHED CIVILIAN EMPLOYEES	125
III.	LOCKING PROCEDURES	133

CHAPTER NOTES 135–164

APPENDIX NOTES 165–167

BIBLIOGRAPHY 169–184

INDEX 185–192

List of Illustrations and Maps

Little Rock District Map, 1985 2
Arkansas River Map 2
Arkansas River Basin Map 3
White River Basin Map 3
The Parkin Site, City on the Mississippi River 4
Hernando De Soto and His Men 4
Arkansas Post 6
French Louisiana, 1763 6
White Settlers in the White River Wilderness 7
Thomas Jefferson Portrait, 1800 7
Douglas Plantation drawing by Alfred Rudolph Wand 8
Brevet Maj. Stephen H. Long Portrait 9
James Monroe Portrait 9
Arkansas River near Fort Smith, AR, Map, 1878 10
Sketch of a Flatboat 11
Sketch of a Keelboat 12
Steamboat With a Load of Cotton 12
Clearing of the Great White Raft 15
Dipper Dredge 15
Revetments on Arkansas River 16
Archimedes, snag boat 16
U.S. snag boat No. 2 17
Charles Russell Suter Portrait 19
Channel Maintenance Map 19
Shields-style snag boat 20
Corps' First Non-Hulled snag boat 20
William Henry Harrison Benyaurd 20
Corps Work at Pine Bluff 22
Eroded Arkansas River Bank at Pine Bluff 22
A Permeable Dike 22
Curtin Dike Boat 23
Hydraulic Pile Sinking Boat 23
Wire Net Machine 23
Mattress Boat 23
Mattresses as Bank Protection at Yell's Bend, 1881 24
Projects Under Capt. Handbury's Charge, 1881 26
Little Rock, Arkansas Drawing 26
Twin Snags on snag boat 27
Little Rock Waterfront, 1885 29
Railroad, 1862 29
Workers Building Willow Mattress 30
Area Restricted to Corps by Maj. Adams 31
Capt. Taber's drawing of Pine Bluff "jetty," 1884-87 31
Lt. Sibert's Upper White River Survey Maps 33
White River Locks 34
The Concrete-capped White River Dams 34
Open Water Navigation for Raft Boats 34
Little Rock District Crews Building Pile and Stone-fill Dikes 36
Pile and Stone-fill Dikes Along Arkansas River 36
White River Lock No. 1 Excavation 37
Spoil Removal from Lock No. 1 37
Official Boundaries of Little Rock District 39
Erosion at Pine Bluff 39
A Fascine Under Construction 40
Area of Lock and Dam No. 3, Upper White River 42
Quarters at Walls Ferry 42
Arkansas, Steel Hulled snag boat 44
Little Rock During Flood of 1927 47
Bridge During Flood of 1927 47
Gilette, Arkansas in April 1927 47
Survey Crew at Work 49
Levee Break and Flooding 52
Boundaries of Little Rock District, 1937 56
Official Boundaries of Little Rock District, January 1939 56
Official Boundaries of Little Rock District, July 1939 56
Map of Little Rock District Civil Works Projects 57
Nimrod Dam Under Construction 57
Nimrod Dam Completed, 1943 58
Dining Room of Contractor Commissary at Norfork Dam 58
Penstocks at Construction of Norfork Dam 59
Norfork Dam Soon After Completion 59
World War II Military Functions Boundaries 60
Camp Beauregard, Louisiana 62
General Layout, Camp Robinson, Arkansas 62
Entrance to Fort Chaffee, Arkansas 63
Frisco Railroad Washed Out, Van Buren, Arkansas, 1945 64
Pontoon Bridge Replaced Frisco Railroad Bridge 65
Forebay of Blue Mountain Dam Under Construction 67
Blue Mountain Dam 68
Clearwater Dam Site 68
Completed Intake at Clearwater Dam 69
Conveyor Belt at Bull Shoals Dam 69
Aggregate Plant at Bull Shoals 69
Bull Shoals Dam Under Construction 69
Duplex Dwelling in Government Village, Mountain Home, Arkansas 69
Little Rock Air Force Base Under Construction 71
Capehart Housing Development Under Construction 71
Titan II Missile Launching Sites 72
Missile Silo Under Construction 72
Flood Water Overtopping Table Rock Dam, 1957 73
Table Rock Dam Completed 73
Ozark Dam and Lake Taneycomo Under Construction 73
Anchor Travel Village Tourist Camp, Branson, Missouri, 1945 73
"Swinging" Bridge Over Little Red River 74
Greers Ferry Dam 74
Table Rock Fish Hatchery 75
President John F. Kennedy at Greers Ferry Dam Dedication 77

Cartoon by George Fisher 78
First Bucket of Concrete Poured at
Beaver Dam Site, 1961 78
Senator John L. McClellan 83
Senator Robert S. Kerr 83
Ground Breaking for Dardanelle Lock and Dam 86
Workmen Washing Foundation Rock,
Dardanelle Lock and Dam 86
Ozark-Jeta Taylor Lock and Dam,
Under Construction, 1966 87
Last Bucket of Concrete Poured at
Lock and Dam No. 13, May 1968 87
Arkansas Post Canal 88
Dardanelle Lock and Dam Powerhouse 89
First Barges at Port of Little Rock, 1968 90
Port of Pine Bluff, Arkansas 90
Highway Bridge Over Lock and Dam
No. 13, 1978 91
Inclined-axis Turbines Installed at
Ozark-Jeta Taylor, 1970 93
Water Wheel Assembled at Ozark-Jeta
Taylor Powerhouse 93
President Richard M. Nixon at McClellan-Kerr
Navigation System Dedication 94
Typical Eight Barge Tow 96
Comparison of Cargo Capacities 96
Cartoon by George Fisher 99
Present Civil Works Borders 99
Millwood Dam Before Impoundment 100
Bull Shoals Powerhouse 103
Great Arkansas Cleanup 104
Contract Park Attendant Program for
Little Rock District 105
Nimrod Lake Wildlife Flood Plot 105

Chapter I

The Geography of the Region and its Early History

Since 1913 the Corps of Engineers has defined District boundaries on the basis of river basins. Little Rock District encompasses the lower Arkansas River basin which includes the Petit Jean and Fourche LaFave rivers; the upper White River basin including the Little Red, Black, and North Fork rivers; and the lower Little River basin including the Rolling Fork, Cossatot, and Saline rivers. The District's irregular boundary links the outside edge of each of these river basins, thereby encompassing all the land between them.[1]

Although the Little Rock District is defined by its rivers, it is dominated by its highlands. The District is much more geographically homogeneous than either Arkansas or Missouri, states composed of two sharply contrasting topographical regions.[2] The District includes the very similar upland sections of both states and excludes the lowland and prairie sections. The region is also more socially and economically unified by section than by state. The dichotomy between more affluent, large-scale agricultural areas of lowlands and prairie and the historically more independent, wilderness-oriented highlands characterizes the two states, but not the District.

Thus, Little Rock District encompasses most of the interior highland province, the only mountains between the Appalachians and the Rockies. This province is divided into two irregular halves: the Ozark Mountains area and the Ouachita Mountains area.

Located in the north, the Ozarks rise abruptly from the eastern lowlands; the shift from the lowland to the hill section is forecast by only a few mound-shaped sentinel hills. The rolling, tree-covered uplands gradually gain altitude as they continue west and south. The Ozarks proper are composed of sedimentary rocks in flat strata. The Ozarks have been eroded into flat-topped plateaus, divided by steep winding hollows through which streams meander. In the northwest the plateaus are fairly level; in the south, they give way to the Boston Mountains, the most rugged of the Ozarks. Here gorges 500 to 1,400 feet deep lie between steep ridges and jagged spurs. The Ozarks are thickly wooded throughout.

To the south are the Ouachitas. They range from Little Rock across the western half of the District. The Ouachitas are quite high near the western edge. In the south they dwindle into the Gulf coastal plain which stretches up into southwestern Arkansas from the Louisiana and Texas borders. The rocks of the Ouachitas are more varied and their strata are more tilted and uplifted than those in the Ozarks. Ridges run more regularly east and west; valleys are usually wider, with parallel east-west running streams. Like the Ozarks, the Ouachitas are forested throughout.

The Arkansas River separates these two groups of mountains. The main river flows southeast across the alluvial and gently rolling terrain lying between the two. The Petit Jean and the Fourche LaFave are the major Arkansas River tributaries within the District. They flow from the Ouachitas. The Arkansas River itself originates at about 14,000 feet on the eastern slopes of the Rocky Mountains near Leadville, Colorado. It crosses interior plains before it reaches the fertile valleys of Arkansas and joins the Mississippi River about 1,500 miles from its source. The upper portion of the Arkansas in southeastern Colorado flows through mountainous terrain. Then across south-central Kansas the valleys widen and the grades decrease. Through Oklahoma to near Tulsa the river is crooked and subject to shifting channels. From there it is controlled and improved by the McClellan-Kerr Arkansas River Navigation System. The river enters Arkansas and the Little Rock District from the northwest at Fort Smith. Then it cuts diagonally through the center of the state and enters the Mississippi in Desha County, Arkansas.

The Arkansas River basin includes not only the river with its tributaries and valleys, it also includes their drainage areas: about 160,645 square miles of southeastern Colorado; northwestern New Mexico; south-central Kansas; and the northern sectors of the Texas panhandle, Oklahoma, and Arkansas. Within this vast area all of the river basin within the states of Arkansas and Missouri belongs to the Little Rock District.

The White River, like the Arkansas, originates in the mountains. However, the source of the White lies in the Ozarks. The river begins on the north slope of the Boston Mountains in the most rugged section of the Ozarks. From the northwest corner of Arkansas it flows northeasterly into southwest Missouri before looping southeasterly across north-central Arkansas. The White is joined in east-central Arkansas by its major tributary system, the Black River and its associated streams. This system flows in from the north. The enlarged waterway continues into the lowlands of eastern Arkansas. Approximately 720 miles from its origin, the White River enters the Mississippi in Desha County a few miles from the Arkansas-Mississippi confluence.

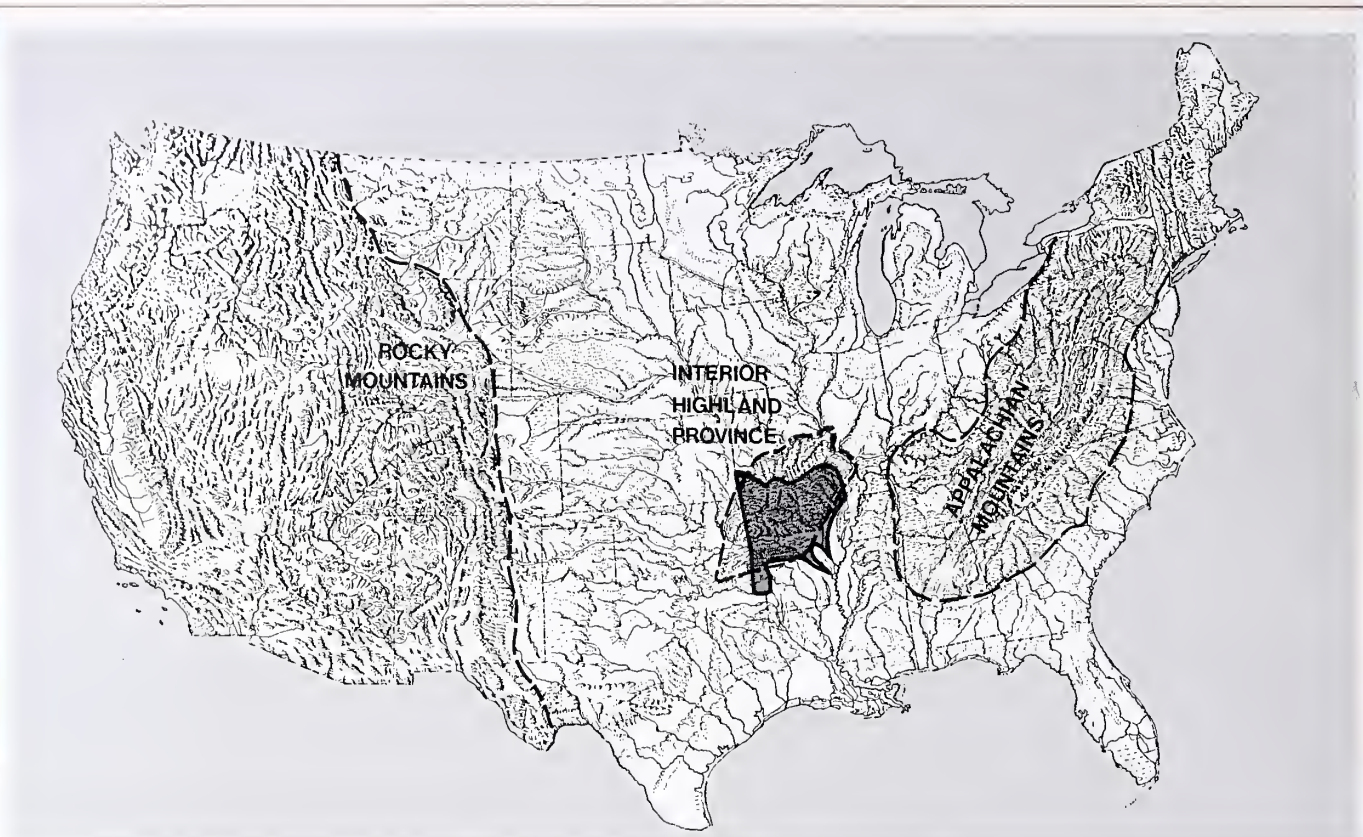


ILLUSTRATION 1. The 1985 Little Rock District and America's interior highland province in the context of the whole United States.

ILLUSTRATION 2. Course of the Arkansas River

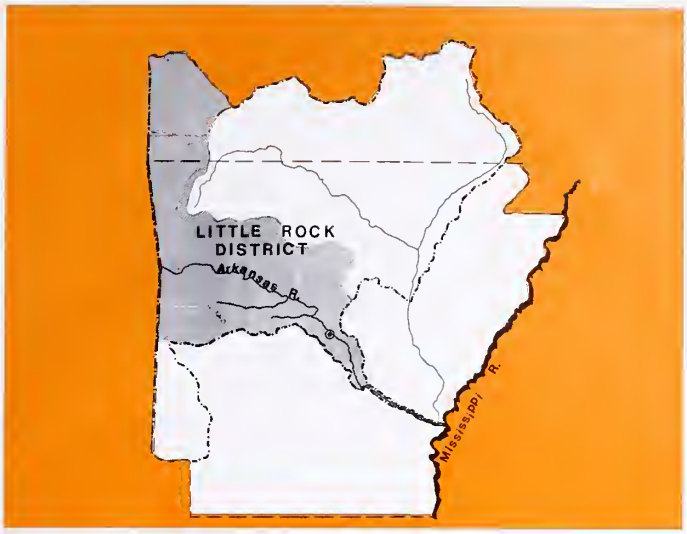


ILLUSTRATION 3. That portion of the Arkansas River Basin in the Little Rock District

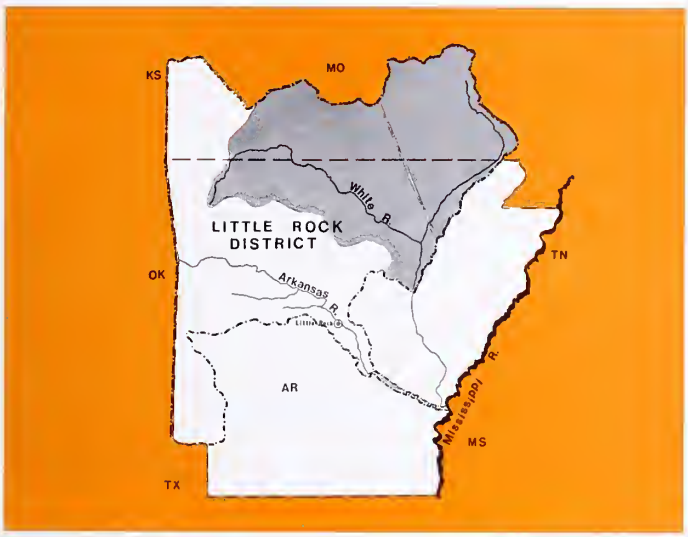


ILLUSTRATION 4. That portion of the White River Basin in the Little Rock District

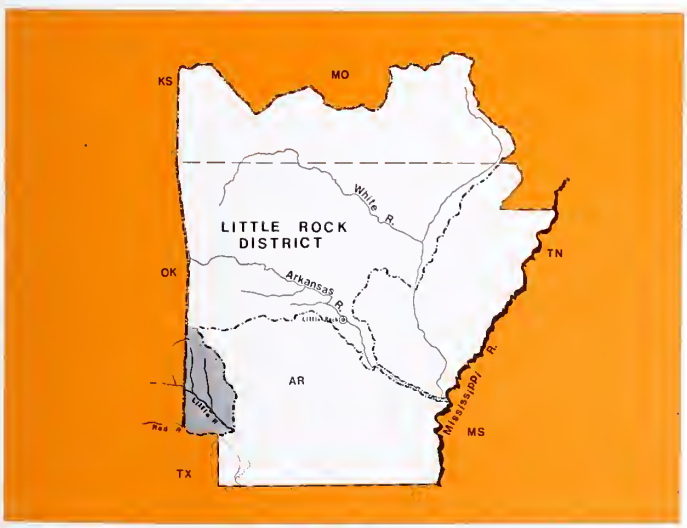


ILLUSTRATION 5. That portion of the Little River Basin in the Little Rock District.

The White River basin encompasses a large area. In the northwest, where the basin is widest, it covers more than 200 miles. In the southeast, it narrows to about 50 miles. In all, it includes about 28,000 square miles, ranging from mountains in the northern reaches to flat Mississippi delta in its southeastern extremity. The Little Rock District contains the uplands portion of this basin.

The Little River is at the opposite end of the District from the White River basin. Originating in Oklahoma, it flows into Arkansas and the Little Rock District from the northwest on a course almost paralleling that of the Red River. Once in Arkansas, the Little River is joined almost immediately by a series of tributaries: the Rolling Fork, Cossatot, and Saline rivers. These reach down from the southern foothills of the Ouachitas and flow into the Little River from the north. Once joined by these tributaries, the enlarged Little River flows southeast to merge with the Red River near Fulton, Arkansas. The Little River basin encompasses most of extreme southwestern Arkansas and a small portion of extreme southeastern Oklahoma. The Little Rock District includes the portion of this basin within the state of Arkansas.

The First Settlers

Although its geography changed many times over the immense span of geologic history, the Little Rock District region was stabilized when the first humans occupied the area approximately twelve thousand years ago.[3] The earliest inhabitants of the region were nomadic Paleo-Indians who hunted a variety of game, including extinct species as the mastodon and mammoth.[4]

About ten thousand years ago the less nomadic Dalton people settled more permanently in the region. Archaeologists consider the Dalton period to be both a transitional stage between the Paleo-Indian and Archaic periods and a part of the Early Archaic period. Living in the Mississippi Valley and adjacent Ozark escarpment of northeastern Arkansas and southeastern Missouri, the Dalton people had to adapt to a warmer, drier environment and to the changing floral and faunal resources characteristic of the period. Dalton technology allowed for sophisticated woodworking including house construction and canoe building.[5]

Some nine thousand years ago, Archaic people lacking in agriculture and ceramic technology began inhabiting the area. They appear to have lived in small bands gradually settling and fully exploiting successively smaller territories. Although Archaic people living in the Ozarks apparently did not have far-flung trade networks, it appears that later Archaic groups exchanged goods outside their own territory, as well as with neighboring groups. These overlapping reciprocal trade patterns became more extensive with time.[6] Perhaps the most distinctive and well known of the Archaic groups in the area were the Bluff Dwellers of the Ozark Mountains region.[7]

The Archaic cultures and similar successors and contemporaries continued to exist in the Ozark Mountains area for a long time.[8] About 700 A.D. different cultures began emerging in the region. A Mississippian culture emerged in eastern Arkansas, while the Variant Caddo sub-culture developed in southwestern Arkansas and along the middle Arkansas River valley.

Waterway systems were vital to these cultures. Extensive trade, transport, and communications networks were integral to the Mississippian and Caddo civilizations that flourished in the area from about 700 A.D. to the mid-1400s. These were not societies conforming to the popular stereotypes of Indians. Rather, they were complex, sophisticated societies more like the popular stereotypes of the Aztecs in Mexico.

The Mississippian peoples typically lived in permanently settled villages with thousands of inhabitants.[9] Their villages were frequently fortified with stockades and included living structures of wattle and daub. Wattle and daub, a common form of primitive construction, consisted of a coarse basketwork of twigs woven between upright poles and plastered with mud. The Mississippians arranged these structures around large mounds that served as bases for important buildings.

Caddoan people resided in dispersed settlements which might extend miles along a river. They usually incorporated a ceremonial center with one or more mounds at one end. Caddoan structures were clearly distinguishable from those of the Mississippians. They were generally large beehive-shaped grass-covered wooden structures.[10]

The Mississippian and Caddoan cultures had access to the world through the rivers in their area. The Mississippian and Caddoan market-type exchange systems brought trade goods from Minnesota, Lake Superior, the Great Lakes basin, and the Atlantic coast to Arkansas and southern Missouri, while exchanging raw materials from Arkansas and southern Missouri. It is possible cultural exchanges occurred with Meso-American civilizations such as the Aztecs.

The Spanish Arrive: 1541-1542

When the Spanish arrived in the sixteenth century, both Mississippian and Caddoan cultures were still flourishing in the Arkansas and Missouri area.

The "Gentleman of Elvas" contemporary account of the adventures of Hernando de Soto reveals that the first Europeans to enter the Arkansas-southern Missouri area also depended on the waterway network of the region.[11] They followed the rivers westward. De Soto, "lean and unkempt, sitting loose in the short stirrups of his high wooden saddle, his horse scrawny and jaded," led about three hundred equally gaunt soldiers, "most dressed in ponchos and kilts of dried grass, though a few luckier ones could boast padded cotton surcoats or rough breeches made from animal skins."[12] Accompanying them were a few priests dressed like the rest of the men; some hungry, exhausted Indian porters; a few fierce, lean war dogs; and about forty horses scarred from battles, ill-treatment, semi-starvation, and neglect.[13]

This band reached the area in July 1541. Coming across the lowlands of present northeastern Arkansas from the Mississippi River, the men were hardened and compacted from living and fighting for over two years throughout thousands of miles of hostile territory. Beset by military and natural disasters, cut off from reinforcements and supplies, having defeated army after army of hostile natives through sheer courage and persistence, they had learned how to live off the land. They entered the region when they crossed the White River just below the mouth of the Little Red.[14]

From there de Soto and his veterans journeyed westward, following the sunset to every rumor of riches. Although it is not altogether clear where they moved, de Soto's band apparently looped south to the Arkansas River valley before turning upriver to the foot of the Ozarks near present-day Little Rock.[15] Continuing westward, it crossed the Arkansas River at a point between modern-day Dardanelle and Fort Smith before passing across the present Oklahoma border. Throughout the explorers' travels, they encountered powerful Mississippian and Caddoan chiefdoms, who for the most part respected the military prowess of de Soto's forces and did not engage in confrontation. The men wintered at a village near the confluence of the Canadian and Arkansas rivers. In March 1542, de Soto, hoping to return to Cuba, struck

ILLUSTRATION 6. Artist's reconstruction of how the Parkin site may have looked about A.D. 1500. This Mississippian city was located on the Mississippi River in northeast Arkansas. It was probably the capital of Casqui visited by the de Soto expedition in 1541.

Reprinted from C. R. McGimsey, **Indians of Arkansas**, *1969. (Courtesy of the Arkansas Archeological Survey)*

ILLUSTRATION 7. Hernando de Soto and his men as romanticized in a popular illustration

(Courtesy of the Illinois State Historical Library)

out in the direction of what he thought would be the Gulf coast. The army angled southeast; passing through the Ouachitas into Louisiana, never to return.

The mission of the de Soto expedition was primarily politico-military: to conquer new land for the Spanish crown by quelling native resistance. Not coincidentally, the military mission had significant secondary civil applications. In a vision at once selfish and exalted, the spread of Christianity was to coincide with a successful military mission. Regardless of the success or failure of the military mission, information was to be gathered and the pool of European scientific, geographic, and topographic knowledge increased.

Had the Spanish military mission been successful, the information gathered would have proved vital to prospective civilian settlers. Europeans, however, did not follow de Soto into the trans-Mississippi interior highland province for over 130 years.

The French Inland Empire: 1673-1762

French penetration into the heart of North America is one of the most dramatic stories of human history.[16] Samuel de Cham-

plain first settled in Quebec in 1608. By 1673, when the British had become masters of only a small area on the Atlantic seaboard, the French were organizing an immense empire stretching from the St. Lawrence River to the Rocky Mountains, from Hudson's Bay to New Orleans. In less than a century the French explored, mapped, and linked this area in an effective metropolitan system of commerce and trade.

Utilizing water routes, the French collected furs from the Native Americans for trade, and brought in goods from Europe. Movement of goods and people was steady and orderly. The system used organizational and administrative structures associated with the French military.[17] Both Champlain and the Sieur de La Salle were trained in the French military tradition, and after 1667 all but one of the governors of New France were military men. A large population was not necessary for the system to function. Fewer than fifteen thousand Frenchmen lived in all of New France in 1673.[18] The system's success depended on trading posts, mission stations, and military forts along waterways throughout the interior.

Like the de Soto expedition before them, French expeditions and settlements had a dual military-civil mission. So closely associated were the military mission and the civil applications of that mission under the French colonial system that it was often difficult to distinguish between trading posts, mission stations, and military forts. Military expeditions sent out to gather information often took missionaries along and had more trade goods than arms. Although the original military mission of French expeditions was the conquest of new land and new people, the military mission of a more mature New France was to keep open the transportation and communications systems of the interior.

Before this change occurred, the difference in approach between French and Spanish explorations was pronounced.[19] The Spanish conquistadors marched across the countryside in large groups of several hundred moving as a unit. They blazed one solitary road through an unknown territory. The French explorers, however, traveled across the countryside in bands of usually fewer than ten men, attempting to make friends with the natives rather than intimidating or fighting with them. The French would join with the natives in hunting and trading expeditions.

The first of the small French bands to reach Arkansas-southern Missouri was a band of seven who arrived in the area of the confluence of the Arkansas and Mississippi rivers in July 1673.[20] Led by Louis Joliet and accompanied by Father Jacques Marquette of the Society of Jesus, this group had a military mission: to gather intelligence for the crown about whether natives inhabiting areas along the Mississippi River were hostile and to determine whether the river emptied into the Gulf of Mexico or into the Gulf of California. The significance of the mission's secondary civil applications is apparent because the expedition was led not by a soldier but by a fur trader accompanied by a missionary.

The natives at the settlement where Joliet and Marquette stopped in July 1673 were neither Mississippians nor part of the Caddoan confederacy. Rather, they represented a less sophisticated woodland Indian culture which used a Siouan language.[21] They eventually came to be known as the Quapaw or Arkansas Indians. The Quapaw provided Joliet with the information he had been sent to gather.

Joliet had already learned much from personal experience about the natives living in present-day Iowa, Illinois, and Missouri. He had also discovered that the Mississippi flowed generally southward. The Quapaw assured him that it continued to flow south to its outlet. They told him that white men who had rosaries were already living around the mouth of the river. This allowed Joliet to conclude correctly that the Mississippi flowed into the Gulf of Mexico. The Quapaw told the French explorers that the Gulf was near and showed them guns, tomahawks, hoes, knives, beads, and an assortment of powder flasks of double glass. The French recognized these items as Spanish trade goods. Joliet concluded that he was on the edge of settled New Spain. He did not understand the large distance over which native trade took place, even for a stone-age tribe like the Quapaw. In light of a Quapaw warning about hostile tribes farther downstream, and with his military mission accomplished, Joliet chose to return to Montreal.

Thus were the Quapaw undisturbed by Europeans for nearly ten years. In March 1682, a party of twenty-three Frenchmen, eighteen Abenaki and Mohican braves, ten squaws, and three children led by the thirty-nine-year-old Rene-Robert Cavelier, Sieur de La Salle, arrived in Quapaw lands.[22] Like de Soto and Joliet, La Salle also had an official military mission: a license from Louis XIV to "discover the western part of our country of New France," to officially claim the territory for the crown, and to construct forts as necessary to hold the country.[23]

La Salle's royal patent also alluded to the civil applications of his mission. The crown granted him a monopoly on the prospective buffalo-hide trade. He was expected to develop this trade in western New France without interfering with the established trade in beaver and other pelts. The expedition party included a missionary priest, Father Zenobius Membre. La Salle gathered enough knowledge on this first trip to receive a 1684 patent to establish a military-civilian settlement at the Mississippi's mouth and to rule Louisiana from there.

Three hundred Frenchmen, women, and children set out for the river's terminus in 1684, but La Salle was murdered enroute by one of his party. Henri de Tonti, his second in command, then established the first European settlement in the lower Mississippi valley.[24] Tonti claimed that in 1682, during their first visit to the area, La Salle had subgranted to him a seigniory over the area around the confluence of the Arkansas and Mississippi rivers.

It was here that Tonti established what has come to be known as Arkansas Post in 1686. This fortified house, which Tonti left in the charge of five Frenchmen, was both a fur trading post and a military-political installation. It is an ideal example of the kind of French station that was hard to label as a trading post, mission station, or military fort, for the military and civil missions of the facility were too intertwined to distinguish one from the other. Arkansas Post was a halfway point between the Illinois Country and the Gulf of Mexico. For the next three decades a few soldiers, visited by an occasional priest, maintained it as a link in the fur trade.

Meanwhile, Jean Couture, a former follower of La Salle, showed British settlers in the Carolinas that they could also trade with the Mississippi valley Indians by following the Savannah River across to the Tennessee and then continuing to the Mississippi. Thomas Welch, a Carolinian, opened up an even easier route from Charleston to Arkansas Post.[25]

It was another British subject, however, the Edinburgh entrepreneur John Law, who fostered the first large-scale attempt to colonize the area. In 1717 the Duke of Orleans, who ruled France as regent for Louis XV, handed over control of the government of Louisiana to the Company of the Indies, popularly known as the Mississippi Company.[26] John Law, director of the company, developed an elaborate plan known later as the "Mississippi Bubble." Law proposed delivering France from bankruptcy by using the anticipated wealth of Louisiana as collateral for what amounted to a massive bond issue. By propagandizing Louisiana as the new Eden, he succeeded in selling thousands of notes at rapidly escalating prices.

ILLUSTRATION 8. Arkansas Post, Seventeenth Century
(Courtesy of the Arkansas Historical Commission)

To reap the wealth of this paradise, Law admitted the need to populate Louisiana with European immigrants. He succeeded in recruiting a substantial number of colonists from Alsace. In the spring of 1719 he shipped five hundred black slaves to the approximately twenty-five hundred acres granted him by the crown near Arkansas Post. The slaves were to ready the post for his settlers. The next year eight hundred Alsatian settlers arrived. In December 1720, however, the financial support of the Mississippi Bubble failed, and Law fled France. His American colonists had been unprepared for pioneer life and suffered unexpected hardships. When they heard Law's plan had failed in Europe, they left the colony. In 1721 control of the Mississippi Company reverted to the French military, and the region was made one of nine commands in Louisiana. Successive French commandants at Arkansas Post wielded full military and civil authority.

During this period members of the French Royal Corps of Engineers were active in the Mississippi River basin.[27] They were principally engaged in mapping the region and constructing fortifications. Their work had civil applications: it provided information vital to prospective pioneers and it aided in making the territory secure and attractive to settlers.

The French Corps, which now had this American responsibility, was the foremost corps of engineers in Europe. The Marquis de Vauban, chief of the corps, was known throughout Europe and America for his expertise in the construction of forts. The French engineers were also known for their civil works, having built some exceptional navigation canals in France. As early as the 1698 visit of Sieur Remy Reno to the Mississippi River basin in the company of a French expedition, the French engineers began to have an impact on the area of the present-day Little Rock District. Reno was probably the first man officially trained in military engineering and fortification design to visit the region. Sieur Le Blond de La Tour, a French engineer officer, is credited with performing the first work to improve navigation on America's inland rivers. He deepened the mouth of the Mississippi and, in about 1720, constructed the first flood control levees on the lower Mississippi.

Most of France's efforts during the eighteenth-century wars between the French and British for control of colonial territories centered on designing fortifications, including some in the Mississippi valley. French trappers and traders supplemented official efforts of the French Royal Engineer Corps in exploring, mapping, and describing the territory of New France while traveling to the interior to meet Native Americans and to harvest pelts and animal fats. Despite this activity, however, by 1762 permanent residents in the region were few.

Spanish Sovereignty: 1762-1803

In 1762, by the secret Treaty of Fontainebleau, France ceded control of its empire west of the Mississippi River to Spain, but Spain was in no hurry to bear the expense of governing the territory and allowed France to continue its control for four more years. In 1766 the Spanish sent their first governor to Louisiana, but even this meant little change for those in the region. French commandants continued to issue orders, now in the name of Spain. French soldiers still formed the garrison at Arkansas Post, whose name was changed to Fort Charles III.

Settlement did increase under the Spanish.[28] Almost immediately the Spanish region west of the Mississippi became a haven for Frenchmen, fugitives, and malcontents from British-controlled areas east of the river. The western banks of the Mississippi also became a focal point for immigration of pioneer settlers displaced from the developing British-controlled Appalachian frontier or for descendants of original settlers of that area who dreamed of opportunities a fresh frontier would offer.

In 1778, with the arrival of George Rogers Clark's Virginia forces in the Illinois Country, the American Revolution became a reality to those living in the adjacent Spanish trans-Mississippi territory. More Americans gained firsthand knowledge of the territory, many settling immediately after the war just across the river in American territory. The lure of the lucrative fur trade that centered on the Spanish side of the river was also strong.

ILLUSTRATION 9. Map of French Louisiana, 1763

Simultaneously, Spanish commandants began making lavish land grants in the eastern half of Arkansas to encourage settlement.

After 1788 Spain offered American frontiersmen free land, equal trading privileges, and the right to sell their produce at high prices in royal warehouses if they immigrated to Spanish-held North America. Cabins appeared on the Arkansas and White rivers. By 1797 the population of the Arkansas District was listed as 368.[29]

Early settlers were frontiersmen living a subsistent existence.[30] The only products of the region that were commercially valuable beyond the area were furs and animal fats. The settlers made, grew, or hunted for their own necessities with the exception of guns, powder, and some services such as blacksmithing. Even lead for bullets was mined locally. This, with salt, was a major local trade item.

ILLUSTRATION 10. The First White Men Penetrate The White River Wilderness
(Courtesy of The Ozark Mountaineer)

Cotton as a cash crop was introduced into the area about 1800.[31] At first, it was raised exclusively by small homesteaders in the alluvial valleys of the area. Within the region it was only grown in the reaches of the Arkansas River valley southeast of Little Rock.

On 1 October 1800, by the Treaty of San Ildefonso, Spanish rule in Louisiana ended, and the colony was returned to France. Before Spain transferred actual possession to France on 30 November 1803, Napoleon sold the territory for $15 million. Inhabitants along the Arkansas and White rivers did not know of the exchange of colonial power until after the Louisiana Purchase.

American Exploration and Settlement: 1803-1820

From the beginning of official American control of the trans-Mississippi West, various branches of the U.S. Army played a deliberate role in the settlement and development of the area.[32] Almost immediately after the 30 April 1803 treaty of cession was signed, the Louisiana District was, as a temporary expedient, made a part of the Indiana Territory. President Thomas Jefferson appointed W.C.C. Claiborne, governor of the Mississippi Territory, and Major General James Wilkinson, commander-in-chief of the Western Army, jointly to govern the Louisiana District.

In March 1804 Jefferson approved an act of Congress dividing the Louisiana District into the territories of Orleans and Louisiana. The Arkansas-Missouri area was included in the northernmost, the Louisiana Territory. In 1804 Arkansas Post was formally taken over by a U.S. Army detachment under Lieutenant James B. Many. In March 1805 the Territory of Louisiana was officially created by an act of Congress, and General Wilkinson became its civil and military governor.

At the time of the purchase, no one knew Louisiana's contents or actual boundaries. Therefore, President Jefferson had military men with technological and engineering training explore the area. They prepared topographic and hydrological maps; developed meteorological observations; gathered military intelligence about the strength and location of possible enemies, native and European; and constructed fortifications. They also furnished reliable information about physical, environmental, and economic

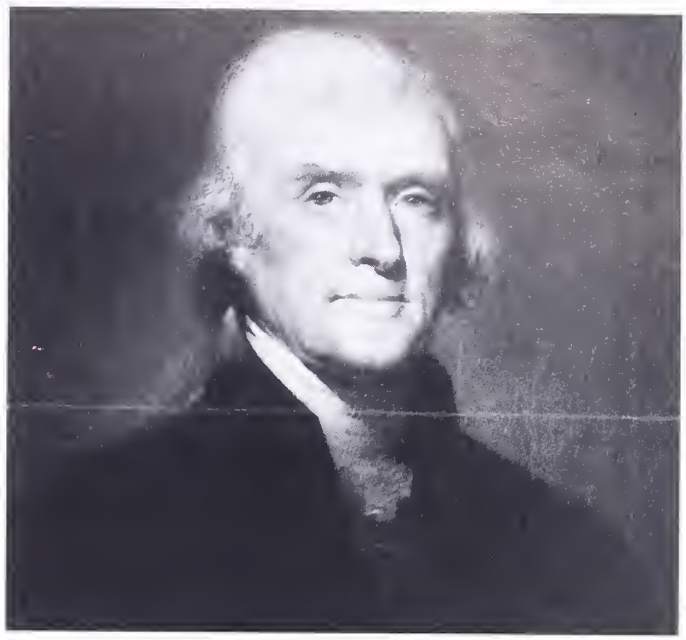


ILLUSTRATION 11. "Thomas Jefferson" in 1800 as depicted by Rembrandt Peale. President Thomas Jefferson presided over American acquisition and initial exploration of the Louisiana Purchase. He consciously and deliberately used the activities of the military to foster settlement and development in the trans-Mississippi West. Jefferson was also the first president to assign responsibility for providing military engineering services with specific civil application to the Corps of Engineers.
(Courtesy of the Illinois State Historical Library)

details vital to prospective settlers and assessed prospects for settlement. Later they quelled native resistance to the incursions of settlers. The governmental policy of fostering settlement and development of the region through military activities was deliberate. The mission was again primarily military with significant secondary civil applications.

The first representative of the U.S. Army to be sent into the present-day Little Rock District was Lieutenant James B. Wilkinson, son of the controversial governor of the Louisiana Territory, General Wilkinson.[33] The younger Wilkinson began his journey in 1806 as part of Lieutenant Zebulon Montgomery Pike's second and most famous expedition. Aaron Burr and the elder Wilkinson were at that time plotting to seize the land through which this expedition passed and to form it into a new western empire. The area also appeared the likely site for an imminent war between the United States and Spain.

Neither Pike nor any members of his expedition were in the Corps of Engineers. They were assigned to the Western Army. Pike received his marching orders for this expedition from General Wilkinson on 24 June 1806.[34] Pike's official military mission was to establish a lasting peace between the Kansas and

Osage nations in the Louisiana Territory and to reach some understanding with the Comanches. The elder Wilkinson suggested that this work would take Pike to the heads of the Arkansas and Red rivers and near the settled areas of New Mexico. In addition, Pike was ordered to observe the geography, natural history, and population of the country through which he passed. He was to collect and preserve mineral samples and botanical specimens, to make detailed and accurate maps of the areas through which he passed, and to observe the eclipses of Jupiter's satellites.

The expedition embarked three weeks later, on 15 July 1806, from Fort Bellefontaine near present-day St. Louis, Missouri.[35] Lieutenant Pike was accompanied by eighteen of the men who were with him at the headwaters of the Mississippi River the previous year plus Lieutenant Wilkinson, a volunteer surgeon, an interpreter, two additional privates, and fifty-one Osage Indians. Pike was charged with returning the Indians to their home on the Grand Osage River. The party proceeded across Missouri into modern Kansas before picking up the Arkansas River near Larned, Kansas.

There, on 28 October 1806, the expedition divided, with Pike and the bulk of the party heading on to the source of the river in the Rocky Mountains. Lieutenant Wilkinson, four privates, and the only remaining Osage Indian in the party proceeded downstream toward the confluence of the Arkansas and the Mississippi rivers. Wilkinson's group left in two newly constructed, buffalo-skin and green-cottonwood canoes carrying twenty-one days' provisions. They expected to reach the Mississippi within two or three weeks. Wilkinson and his band did not, however, reach Arkansas Post until 9 January 1807, seventy-three days later. The expedition was the first to descend the Arkansas River in Oklahoma and western Arkansas, and the information it gathered and disseminated was vital to prospective settlers.

The findings of the mission fostered development and settlement in the region. Settlement increased between 1800 and 1810, and the population of the area almost tripled from 368 in 1797 to 1,062 in 1809.[36] Not only were there more settlers in this post-1800 period, but the kinds of settlers also differed. Fewer of the pioneers arriving in this period were looking for furs and a frontier subsistent lifestyle. More came looking for land to clear and cultivate. Cotton-based agriculture increased in the alluvial valleys and on the lowlands south and east of the region. The small homesteaders growing cotton were gradually replaced by settlers with enough capital to buy their own cotton gins. These were followed by slave-holding planters from older, established parts of the South. The large plantations usually had land touching one of the rivers, and the planters built their own wharves.

As the larger plantation economy became established, pressure for river improvements in the region began to develop. An unpredictable river made agriculture, always seasonal and dependent on weather, even more so. If the autumnal rise in water level was delayed or did not occur, a transportation crisis developed. If the spring flood was too great or lasted too long, crops could not be planted and an agricultural crisis developed. Moreover, the plantation system could not expand unless more usable river frontage became available upstream, providing sites for existing plantations to be expanded and new plantations to be established.

As the plantation system spread, the social and economic dichotomy between lowland planters and upland frontiersmen became more pronounced. The planters rapidly became dominant in the only thriving economy of the general area and came to dominate the politics of the region. However, frontiersmen remained the dominant social, economic, and political group in the more homogeneous geographic area of the present-day Little Rock District.

These trends continued after an 1811 tragedy led to a sudden upsurge in population in the area. The massive New Madrid earthquake, centered in eastern Missouri, resulted in abandonment of some of the most heavily populated areas of the Mississippi River valley. These regions were ruined by river or topography shifts or were subject to continued tremors. Many settlers moved south to the banks of the White and the Arkansas rivers. The government fostered this shift by granting displaced settlers certificates entitling them to free replacement holdings on government land.

In May 1812 Congress passed more legislation deliberately promoting settlement and development of the region. The act authorized rewarding veterans of the War of 1812 with land grants

ILLUSTRATION 12. Drawing of Douglas Plantation, Arkansas River, The Landing Place by Alfred Rodolph Wand (1828-1891) (Courtesy of the Historic New Orleans Collection, Acc. No. 1977.137.9.1.)

in the region. Few veterans came, but many sold their claims to settlers who did. The law also led to the survey of six million acres of bounty lands. The new settlers came from the same two groups as their predecessors had—frontiersmen and planters—they just came in greater numbers. Settlement occurred in lands as far west as the Indian Territory, beyond the present Oklahoma border.

Shortly after creating these bounty lands, Congress admitted Louisiana to the Union. Congress separated the region now in the Little Rock District from the Louisiana Territory and made it part of the newly created Missouri Territory.

By 1817 conflicts began to escalate between the growing number of settlers in the Missouri Territory and the indigenous populations. Besides the Quapaw, dispossessed Indians from east of the Mississippi, especially Cherokee and Choctaw, had been resettled in the southern part of the territory. In 1818 when cotton had risen to the unprecedented price of thirty-four cents a pound, large-scale immigration to less-settled places known to be favorable to cotton growing occurred. Cotton plantations were located on both sides of the Red River as well as on the lowland reaches of rivers farther north. Residents in the southeastern part of the Missouri Territory were clamoring for admission to the Union as a slave state. A vast scramble for all western lands was under way; there was wildcat inflation of the currency. Sectional coalitions and conflicts began to give new patterns to American political life as the first unified political consciousness of the West was making itself felt.

Also, Spain and the United States had never determined where the territory in the Louisiana Purchase ended and where Spanish Mexico began. In December 1817, nearly fifteen years after the initial cession, the Spanish initiated negotiations on this issue. By 1818 the boundary under most serious consideration followed the Sabine, Red, and Arkansas rivers to the North American continental divide.

These factors combined to create the need for a new military mission, a mission fulfilled by the first notable U.S. Army Corps of Engineers' incursion into the area. In 1819 Brevet Major Stephen Harriman Long, a topographical engineer in the Corps of Engineers, conducted the Corps' first official assignment in what is the present-day Little Rock District.

Long was a Dartmouth graduate and former school teacher when Colonel Joseph Gardner Swift, Chief Engineer from 1812 to 1818, first attempted to recruit him as an Army Engineer officer.[37] At first Long became a civilian engineer, but Swift finally persuaded him to join the Corps. In December 1814 Long was commissioned a second lieutenant of engineers and was assigned to West Point where he served as an assistant professor of mathematics. He soon applied for a transfer to the separate Topographical Corps when it was reestablished in 1816. Here Long was given the brevet rank of major. His first assignments included significant topographical and engineering projects on the frontier. He stayed with the Topographical Engineers when, in 1818, they were again placed under the supervision of the Chief Engineer and instructed to complete the exploration of the West.[38]

In 1818 Secretary of War John C. Calhoun directed Long to lead a combined military reconnaissance and scientific expedition down the Ohio and through the Missouri Territory along the Mississippi and Missouri rivers.[39] Long's assignments, especially in the Arkansas River reaches, were not only military but also a specific enactment of the policy during the administration of President James Monroe of fostering settlement and development in the trans-Mississippi West through exploration and mapping activities by the military. This also constituted a return to the policy established by Thomas Jefferson sixteen years earlier of assigning military engineering tasks with significant civil applications to the Corps of Engineers.

ILLUSTRATION 13. Brevet Major Stephen H. Long (Courtesy of the Minnesota Historical Society)

ILLUSTRATION 14. James Monroe became convinced of the importance the trans-Mississippi West had to America long before he became President. As Jefferson's minister plenipotentiary, he, along with America's minister to France, Robert R. Livingston, was personally responsible for the decision to buy all of Louisiana rather than just New Orleans as authorized by President Jefferson. In the early years of his presidency, Monroe, like his friend and mentor Jefferson, consciously and deliberately used the mapping and exploration activities of the Corps of Engineers to foster settlement and development in the area. Towards the end of his presidency, he signed the landmark General Survey Act and the first rivers and harbors act authorizing the Corps to undertake internal improvements not only in the trans-Mississippi West, but throughout the nation.
(Courtesy of the Illinois State Historical Library)

Major Long organized his expedition at Pittsburgh in 1819. Traveling in four steamboats specially designed and built for the expedition, the mixed military and civilian party reached St. Louis in June 1819. Proceeding up the Missouri and the Platte, the group traveled into the Rocky Mountains. The Sabine, Red, and Arkansas rivers had just become the boundary between American and Spanish territories. Therefore, it is not surprising that on returning from the Rockies, Long sent one party down the Arkansas River and another down the Canadian River, which he mistakenly thought to be the Red. The two groups met at what is now Fort Smith, Arkansas, before returning as a single party.

This first Corps of Engineers' incursion into what is the present-day Little Rock District was militarily motivated. In 1818 and 1819 the Corps had no direct civil mission. The purpose of the Long expedition was to support military units operating on the trans-Mississippi frontier and to contribute to the security of the settlements there. Long's assignment for the final leg of his 1819 journey included military reconnaissance, mapping, and construction functions. Not only was he charged with preparing detailed maps and charts of the Arkansas River, he was also entrusted to gather information on the country and the Indians present there and was charged to select a site for a fort.

The site Long selected for a fort was opposite what was known as the "Great Sand Bar" in the Arkansas River. This sandbar, a half mile wide at low water, had served as an Indian trading center and was an established point of community. Although Long selected the location for the fort, another branch of the Army built it. Congress, following precedents set by British and colonial practice, divided construction responsibilities between the Army's engineering branches. The Corps had responsibility for building bridges, roads, and fortifications, while the Cantonment Division of the Quartermaster Corps built and provided shelter for troops. The frontier fort functioned to shelter troops rather than to fortify the area. That is why the Quartermaster Corps built Fort Smith on the site selected by Major Long.[40]

The secondary civil applications of Major Long's mission are easy to observe and were intentional. His work increased knowledge about the area, which was useful to merchants, pioneers, and river navigators. His efforts aided in quelling Indian resistance to settlers and assisted in the defense from Spanish Mexico. The military presence also helped placate irate settlers in the territory who resented the resettlement of Indians dispossessed east of the Mississippi.

Long's mission occurred as the region became politically volatile. In early 1819 the question of Missouri statehood was before Congress. During the debate Representative James Tallmadge, Jr., of New York introduced an amendment intended to prohibit slavery in the prospective state. In a vote on strict sectional lines, the House accepted this revolutionary idea, but the Senate rejected it. On 2 March 1819, in an attempt to reach a Compromise, the less populous southern part of Missouri was organized separately as the Arkansas Territory, and any attempt to bar slavery there was stifled. In the 1820 Missouri Compromise, Maine was separated from Massachusetts and admitted to the Union as a free state, while Missouri, minus the Arkansas Territory, was admitted as a slave state. Thus was the balance between slave and free states preserved in the Senate.

Meanwhile, the newly defined Arkansas Territory continued to develop. By 1820 its population was 14,272.[41] Settlement had spread throughout the territory so that Arkansas Post, in its eastern extremity, was no longer convenient as the capital. On 1 June 1821 the capital was moved to Little Rock, future District headquarters for the Corps of Engineers.

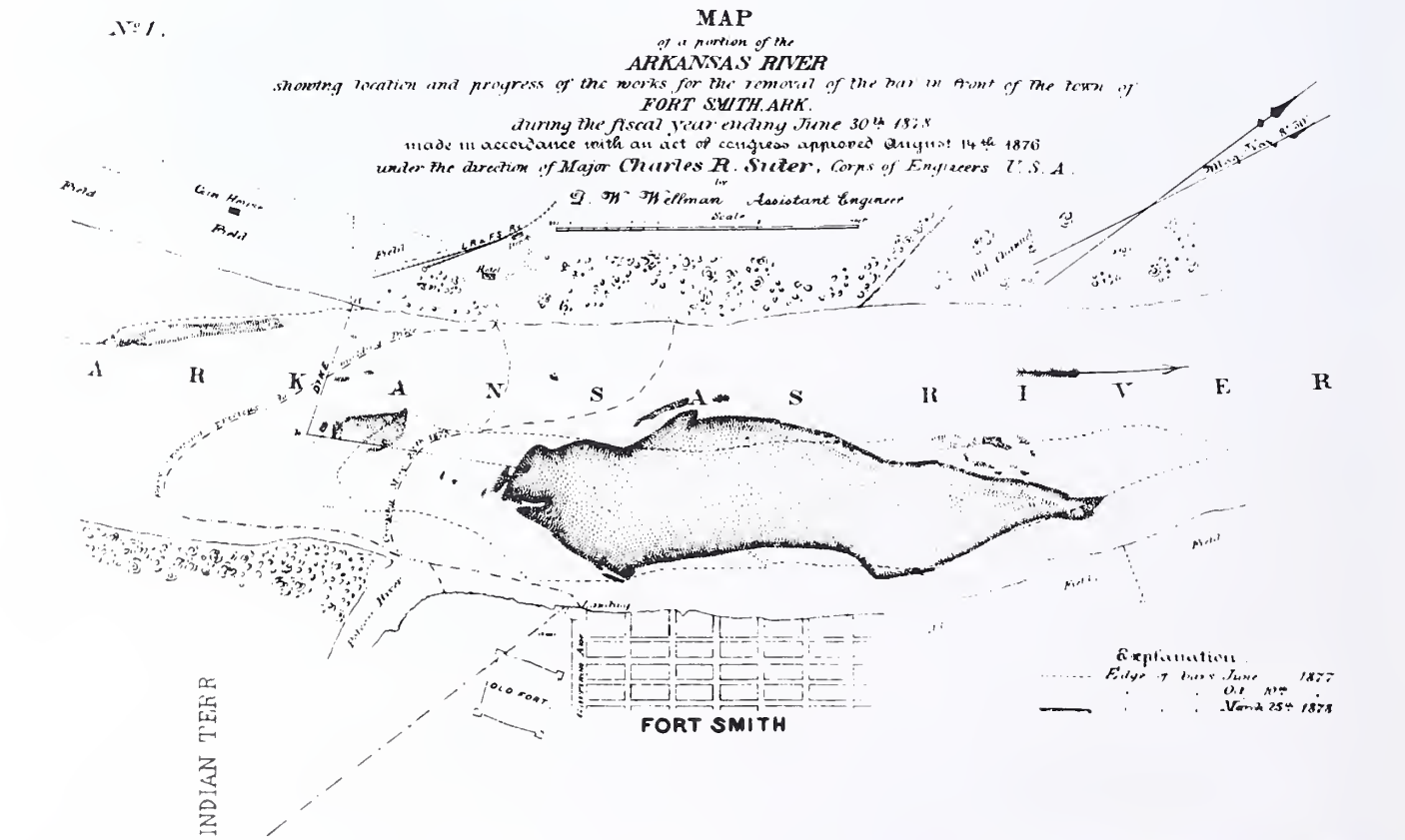


ILLUSTRATION 15. Reprinted from U.S. Army, Corps of Engineers, ***Annual Report of the Chief of Engineers United States Army, to the Secretary of War for the Year 1878***

Chapter II

The Origins of the District, 1820-1881

The period from 1820 to 1881 is one of substantial change in the role of Army Engineers in Arkansas and southern Missouri. Paralleling the Engineers' expanding role nationally, projects to improve transportation regionally went from none to complex operations dedicated to saving individual waterfronts.

In the first two decades of the nineteenth century Congress did not authorize any federally financed and supervised projects to improve inland waterways. Nonetheless, the Corps of Engineers and its Army predecessors always concerned themselves with navigability of the waterways. Lieutenant Wilkinson and Major Long reported the condition of the natural waterways in the areas in which they explored and described the character of the waterborne commerce before 1820.

Early descriptions of the Arkansas River emphasized the difficulties of navigation.[1] Starting in the 1540s when the first surviving accounts were written, commentators described the Arkansas as a lazy, meandering, shallow, silt-laden, sandbar-ridden stream subject to great fluctuations. The inhabitants found living and working in the Arkansas River valley perilous because of the river's fluctuations from low water to flood stage.

In the period through the sixteenth century, the river depths and obstructions restricted commerce and transportation to light-draft watercraft. The boats were generally canoes, dugouts, pirogues, and bullboats.[2] Indians and frontiersmen carved dugouts from tree trunks, made pirogues by hollowing out large logs, and constructed bullboats by stretching animal skins over crude wooden frames. As these boats were light-draft, they were eminently suited for shallow rivers like the Arkansas. Unfortunately, they could carry little.

During French and Spanish sovereignty from the 1690s until the 1790s, travelers in the area used these same types of watercraft plus bateaux and a few flatboats. Although bateaux and flatboats were stable vessels with greater capacity than canoes, dugouts, pirogues, and bullboats, they too were light-draft. The bateau, originated by the French, had a relatively complex ribbed and planked construction. The flatboat, however, was simple enough to be constructed by an amateur.

Flatboats were essentially large wooden boxes, from fifteen to fifty feet long with high sides. The drawback of flatboats in Arkansas and southern Missouri was that, because they depended

ILLUSTRATION 16. A sketch of the type of flatboat used on the rivers of the Arkansas, White and Red River Basins

Reprinted from Victor Collot, ***A Journal in North America in 1796***

on the current for motive power, upstream navigation was almost impossible. Unlike streams in regions east of the Mississippi, most streams in this area ran from relatively uninhabited areas to more developed ones. Consequently, eastern patterns of immigration and import by flatboats were not possible. The boats were, however, useful for export. In this area where lumber became an economic product, the widespread practice of dismantling flatboats at the end of the journey and reusing or selling the lumber from which they had been constructed was an attractive option.

Because of the limitations of flatboats, light-draft, limited-capacity canoes, pirogues, and dugouts from earlier periods still best suited the needs of traders and subsistent frontiersmen, most of the region's population in the eighteenth century.

After 1790 immigration increased and new kinds of settlers began arriving in the area. Homesteaders looked for land to clear and cultivate, and the first planters also arrived. These settlers needed and used new, stable, large capacity craft able to carry a family and its possessions upstream. Keelboats evolved from bateaux.[3] Their keels were rigid longitudinal timbers capable of withstanding scraping over sandbars or bumping into snags. The boats themselves were constructed of ribs covered with plank. They were from thirty to seventy-five feet long and five to ten feet wide and could carry fifteen to forty tons. Unlike a flatboat, which only had an awning-like overhang at one end under which passengers could shelter themselves when it rained, a keelboat had an actual cabin. A keelboat's superstructure typically involved a single cabin occupying the entire hold of the boat except for small decks at each end and narrow walkways running its length on its outside edge. Keelboats had masts and sails which were used whenever possible, but the boats were frequently propelled by crewmen standing at the prow and repeatedly ramming long, iron-tipped poles into the streambed, bracing the poles against their shoulders, and walking the boat upstream under their feet. Where the current was swiftest, keelboatmen resorted to cordelling (putting the crew ashore to pull a rope attached to the bow or mast) and warping (tying the rope to an upstream tree and pulling from the deck of the boat).

Flatboats and keelboats were the mainstay of downstream or export traffic in the area until the 1820s when the steamboat revolutionized transportation. In fact, development of the steamboat can be considered the chief technological innovation in the United States in the early nineteenth century. It launched a revolution in transportation that integrated disparate sections of the country and allowed commercial development of previously isolated areas. The emergence of the steamboat was a major factor in the realignment of trade routes and in the development of urban areas along waterways. These cities grew at the expense of inland settlements situated on traditional overland transportation and communication routes.

In the Arkansas River basin the introduction of the steamboat brought more large-scale planters from the South. Now they could get their crops to market and send slaves ahead to clear land and build facilities, enabling their families to come to the new country with a minimum of frontier hardship. New plantations had rapid transportation, commerce, and communication with the older, more civilized areas of the country.

The first steamboat on the Arkansas River was the *Comet*, which arrived at Arkansas Post in March 1820.[4] On the first sixty-mile trip the boat traveled the long way from the mouth of the shallow, slow-moving Arkansas rather than taking the more practical, well-known shortcut up the deeper White River. It is not surprising that the Comet ran aground several times between the Mississippi and Arkansas Post. Boats traveling the shortcut avoided this particularly shallow reach of the Arkansas by going up the White from the Mississippi and then cutting over to the Arkansas a few miles below the Post.

Later that year a second steamboat, the Maid of Orleans, traveled upriver to the Post. By March 1822 the Eagle had traveled up the Arkansas past Little Rock. A few months later the Robert Thompson arrived in Fort Smith.[5] By the end of the 1820s shallow-draft steamers were able to ascend the Arkansas River as far as Fort Gibson in the heart of the Indian Territory in what is presently Oklahoma.

Introduction of the steamboat to Arkansas waters led to a substantial increase in use of the river. Fortunately, Congress and the federal government reconsidered how river work could aid navigability.

Congress Authorizes the Corps of Engineers' Internal Improvement Work

The same sectional coalitions and rivalries that had been solidified and dramatized by the Missouri statehood debates of 1819 and 1820 reemerged in the Eighteenth Congress of 1823-1825. The debate raged over the constitutionality of

ILLUSTRATION 17. The Keelboat

(Courtesy of Illinois Historical Library)

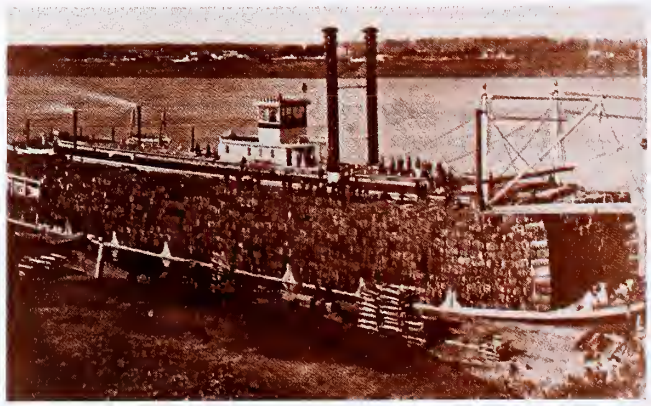


ILLUSTRATION 18. Steamboat with a load of cotton

(Courtesy of the U.S. Army Corps of Engineers, Little Rock District)

federally constructed and supervised internal improvements, but it did not divide the country as deeply as the Missouri debates had. The memory of the earlier crisis and the potential for violence were fresh enough to prevent a similar situation from developing. Congress thus tried to resolve the fundamental issues under the guise of less explosive, more compromising themes.

As the population and the economy of the West continued to grow, so did a united political consciousness.[6] Led by Speaker of the House and presidential candidate Henry Clay, the western bloc in Congress pushed for appropriations for projects to improve inland waterways as a benefit to navigation. Proponents of these projects distinguished between inland waterway projects and other internal improvements. They argued that navigable waters were a national, not a state, concern. After all, rivers were frequently boundaries between states, often ran through several states, and were a "common commercial highway of all."[7]

In early 1824, while the heated debate on Clay's "American System" of authorizations and appropriations was under way in Congress, the Supreme Court issued its landmark *Gibbons* v. *Ogden* decision.[8] In keeping with Chief Justice John Marshall's personal belief in a powerful central government, the Court interpreted the commerce clause of the Constitution to justify the federal regulation and improvement of navigable waters.[9] The Court ruled that a state could regulate commerce that began and ended in its own territory but not a transaction involved crossing a state line; then national authority took precedence. Furthermore, by specifically denying the right of any one company to monopolize the use of the steamboat, the decision opened the interstate steamboat business. Consequently, the *Gibbons* v. *Ogden* decision resulted in a temporary hiatus in opposition on constitutional grounds to federally financed inland waterway projects and in a boom in travel and transportation. Pressure increased for waterway improvement.

Bolstered by *Gibbons* v. *Ogden* and supported by influential members of the executive branch such as Secretary of War John C. Calhoun, congressional proponents of inland waterway improvements forged a new alliance with proponents of other internal transportation improvements. The members of this alliance succeeded in getting the Eighteenth Congress to pass two pieces of landmark legislation. On 30 April 1824 President James Monroe signed the General Survey Act authorizing him to assign Corps of Engineers' officers to survey roads and canals important for national commerce and defense and for the transport of mail.[10] The act was unusual in that with it Congress delegated to the executive branch of government the power to decide which internal improvement projects should be made and in what order they should be made. It constituted a continuing general congressional authorization for the Corps of Engineers' internal improvement work.

Congress then passed, and on 24 May 1824 Monroe signed, the first rivers and harbors act. With this act Congress authorized the President to assign the Corps of Engineers to specific projects that would improve and maintain seaports and internal waterways as a benefit to navigation.[11] Since 1824 almost every Congress has passed at least one or more rivers and harbors act.[12] The 1824 act and each subsequent rivers and harbors act has contained two principal parts. One authorizes the Corps to conduct preliminary examinations and surveys at designated locations, and the other authorizes specific rivers and harbors projects in accordance with reports previously submitted by the Chief Engineer.[13]

Secretary of War Calhoun and Speaker Clay were responsible for getting the work authorized both by the two original 1824 acts and subsequent rivers and harbors acts assigned to the Corps. Calhoun had argued that, by training and employing the Corps on these projects in peacetime, the nation would be assured of the availability of competent military engineers in wartime. So Clay, accepting Calhoun's arguments, ensured that the final legislation included the provision that the Corps of Engineers be assigned the work.[14] Here, by official government policy, the civil applications of the Corps' military mission overshadowed the military mission itself. The legislators justified their decision on the grounds that it contributed to the national defense and helped the federal government exercise its responsibilities to regulate interstate commerce and transport mail.

After the two acts were signed, Secretary of War Calhoun appointed a Board of Internal Improvements to plan, set priorities for, supervise, and, where possible, perform the surveys authorized under the provisions of the General Survey Act.[15] Because the board was so small (it consisted of three Corps officers and one civilian engineer), it seldom actually conducted surveys. The Corps of Engineers conducted most of the 146 projects the board ordered under the General Survey Act. Congress gave responsibility for implementation of the projects authorized by the first rivers and harbors act directly to the Corps of Engineers under Chief Engineer Major General Alexander Macomb.

The First Corps of Engineers' Improvement Projects in the Region

The Board of Internal Improvements authorized the first Corps of Engineers' improvement projects in the Arkansas southern Missouri area. Of all the projects that the board examined for potential construction, it eventually approved construction of only a little over forty, two of which were in the area.[16] Congress appropriated $2,470.18 for surveying and making a military road from the west bank of the Mississippi River opposite Memphis, Tennessee, to Little Rock under the provisions of this act.[17] In 1828 General Macomb estimated that the work would take six months to complete. Congress also authorized the Corps to survey and make a road from Little Rock to Gibson Cantonment in Indian Territory. Gibson Cantonment was the "temporary" quarters for troops assigned to defend settlers from the Indians. General Macomb estimated this work would cost $7,558.26 and take six months to complete.[18]

The two roads formed a supply line from a settled area to a vital, but remote, military post. Thus, the Corps' first improvement projects in the Arkansas-southern Missouri area were, like Major Long's earlier expedition, military missions authorized as contributing to the national defense. Despite Congress' revised view of the Corps, it still had no direct civil mission.

The initial emphasis on road work in the area is very understandable. Because the Arkansas River was so imperfectly navigable, overland transportation had always been relatively important in the region. Given the waterway improvement techniques used in the period, navigability of the shallow Arkansas was likely to remain imperfect even if improved. Therefore, road improvements made more sense here than in areas drained by more easily navigable rivers.

With the Rivers and Harbors Act of 1828, Congress authorized the Corps to begin its first waterway improvement project in the region.[19] This work was on the Red River, a major tributary of the Mississippi. A natural logjam of snags obstructed the Red River for 150 miles from central Louisiana to the Arkansas border. As early as 1825 General Winfield Scott sent a detail to clear the channel, but the soldiers could do little except to report on the magnitude of the task.[20]

Although the Red River "Great Raft" was outside the present-day Little Rock District, work to remove it significantly affected areas now within the District. Because the logjam had created marshes and sloughs in southwestern Arkansas, removing it drained these areas and opened them to greater development.

As was true for all federal waterway improvement projects undertaken in this period, however, this work was intended to benefit navigation and was justified because of national defense, mail transport, and interstate commerce regulation. Increasing the water flow in the Red improved that in the lower Mississippi and opened to navigation a major section of a river whose banks had also already proved themselves to be prime cotton plantation country. Moreover, by 1828 when this project was authorized, hostilities with Mexico over Texas threatened.

Americans led by Stephen F. Austin had already begun to settle in this Mexican territory in large numbers. By 1830 twenty thousand had arrived, bringing with them two thousand slaves. These American settlers did not assimilate; they had no loyalty to Mexico. Most were Protestants, although Mexican law required that all immigrants be Catholics. Few attempted to learn more than a few words of Spanish. "American" Texans hoped and expected that the United States government would help them defend their interests and autonomy from "foreign" Mexico, and the American government leaned in that direction. Just before the Red River improvement work was authorized, President John Quincy Adams offered Mexico $1 million for Texas. Shortly after the improvement work was authorized President Andrew Jackson increased the offer to $5 million, but Mexico still would not sell. Although the contingency was never realized, a Red River navigable to Texas would have been vital to troop movements should the U.S. Army be ordered to intervene on behalf of American Texans. Thus, the Red River improvement could be justified in terms of military preparedness as well as in terms of benefiting internal commerce.[21]

Removing the Great Raft and snags from the Red River required more than just manpower. Congress authorized the Corps of Engineers to acquire a means of removing snags from the Ohio and Mississippi rivers in a major provision of the Rivers and Harbors Act of 1824.[22] A snag was any timber obstruction to navigation. Water-soaked snags such as those on the Red River were deeply embedded in the river bottoms. When exposed at low water they could be sawed off and chopped down, but in a river channel the resulting stump would prove even more dangerous to boat traffic because a pilot could not see it. A powerful mechanism to extract the entire snag was needed, but such a machine did not exist.

Because Congress called for prompt action, Chief Engineer Macomb turned immediately to private enterprise. In 1824 he advertised in several newspapers asking for bids from private contractors. Macomb, therefore, established a tradition in the initial year of Corps internal improvement projects of relying on civilian experts and hired consultants. The tradition of privatization or contracting out, to use today's terms, remains. In this early endeavor the Corps awarded John Bruce, the developer of a snag-removing machine, the contract to remove snags in the Ohio and Mississippi rivers, and work commenced in 1825.

Soon after, in December 1826, the Chief Engineer appointed Captain Henry M. Shreve Superintendent of Western River Improvements. Shreve, clearly as famous an early engineer as Major Stephen Long, achieved almost legendary status along the Mississippi River and its major tributaries.[23] A man of driving energy, Shreve began his career as a keelboatman. In 1814 he piloted the steamboat *Enterprize* with a cargo of munitions from Pittsburgh to New Orleans, arriving in time to participate in the Battle of New Orleans. Shreve brought the *Enterprize* back to Louisville in 1815 on what was the first steamboat trip upstream. From 1816 until 1826 he was one of the foremost steamboat captains on the inland rivers. Shreve served as Superintendent of western river improvements for the Corps of Engineers until 1838.

In 1831, under President Andrew Jackson's administration, the Topographical Engineer unit was once again separated from the Corps of Engineers. It was established as an independent bureau of the War Department with its own Chief Engineer.[24] In 1838 President Martin Van Buren transferred responsibility for the implementation of waterway improvement projects from the Corps of Engineers to this newly renamed Corps of Topographical Engineers.[25] Shreve went with the work, remaining superintendent of the Topographical Corps Office of Western River Improvements from 1838 to 1841.

Soon after he assumed the superintendency in 1826, Shreve determined that Bruce, who worked for his office, could not adequately complete the job he had begun, and he terminated Bruce's contract. Shreve continued the work using crews of workmen with hand tools and the inadequate Bruce machine. Simultaneously, he began developing what became the first steam-powered snag boat.[26]

Completed in 1829, the *Heliopolis* was actually two steamboats with hulls, each one hundred feet long and twelve feet wide, spaced ten feet apart and connected by strong timbers. It had a "snag head," a timber bulkhead covered with quarter-inch sheet iron mounted at waterline between the two hulls near their bows. The boat rammed snags head-on thus bringing to bear the weight of the boat, the power of the engines, and the force of the current to smash snags loose from the river bed. The snags were then raised between the hulls of the *Heliopolis* with windlasses and sawed into chunks for firing the boilers or other convenient uses.

Although the *Heliopolis* was used first on the Mississippi River between 1829 and 1832, it was in removing the Great Raft on the Red River that both the boat and Shreve won their greatest recognition. Under the system Shreve devised, the attack on the raft did not rely exclusively on the *Heliopolis* and the three other snag boats he built modeled after it. Rather, it was a three-phase operation involving an immense amount of manual labor. First, work crews with hand tools cut away snags and overhanging trees in island chutes and on sandbars that might endanger navigation at high water. Then the snag boats removed the larger snags from the main channel. Finally, the snag boats and working crews returned at low water and removed snags newly exposed or newly deposited.

Shreve did not personally oversee the complete elimination of the Great Raft on the Red River. He was only actually involved in the project from 1833 until 1838. In 1841, when Captain Shreve was relieved of his duties as Superintendent of western river improvements by President John Tyler, retired General Thomas T. Williamson used a snag boat he purchased from the Corps to continue the Red River snagging work as a government-hired contractor. The job required continual appropriations until it was completed in 1872.

The Corps of Engineers Begins Improvements to the Arkansas River

In 1830 President Andrew Jackson signed the Indian Removal Act. The act forced the relocation of mainly Cherokee, Choctaw, Chickasaw, Creek, and Seminole tribes, dispossessed from the southeastern United States, to present-day Oklahoma. Over by 1840, this long miserable procession of the Indians was known

ILLUSTRATION 19. As shown here, from 1833 to 1838, Captain Henry Miller Shreve personally oversaw the clearing of the Great Raft from the Red River. The citizens named the town of Shreveport, Louisiana for him and he became one of the best known engineers in the United States. Simultaneously in 1833 and 1834 he personally oversaw the first federal snagging operations on the Arkansas River.

(Used by permission. Copyright ©1970, The R.W. Norton Art Gallery, Shreveport, Louisiana).

as The Trail of Tears. The act also established what was known as the Permanent Indian Frontier Line just west of Arkansas and Missouri. Army posts beyond this line were garrisoned to prevent conflict between the Indians being forced to migrate and the Plains Indians living there.

In addition to focusing journalistic and popular attention on the area, this forced migration fostered tremendous upstream steamboat business on the Arkansas River. Because much of the transport of people and supplies was funded by the federal government, federal bureaucrats and officials, especially military officials, became directly aware of the difficulties of navigation on the shallow, sandbar-ridden Arkansas River. Federal improvement of the river was certainly in their interest.

Not coincidentally, the Rivers and Harbors Act of 1832 authorized the federal government to maintain a channel in the Arkansas River.[27] The channel was to be wide enough and deep enough for "free passage of heavy boats" and was to extend about 465 miles, from the mouth of the Mississippi to the Grand River in the heart of Indian Territory. It is easy to see how Congress and the Corps tied the Arkansas River improvement work done in 1833 and 1834 to national defense. Fort Gibson, by then a permanent military garrison in Indian Territory, was located at the confluence of the Grand and Arkansas rivers.

The 1832 legislation authorizing river improvements did not call for locks and dams. Instead it limited the work to snagging, dredging, revetments, and contraction works, in keeping with Corps practice throughout the country. During this period snags were commonly perceived as the greatest single hazard to navigation, as reflected in the importance given in the first rivers and harbors act to their removal. As one riverman expressed it in 1824, if snags "were removed and kept so, the rivers would assume a new aspect, highly creditable to those engaged actively or passively, in the contemplated improvement."[28]

Another activity important in improving the Arkansas River was dredging. Although similar in philosophical approach to snagging, dredging requires different machines to remove loose silt, sand, and earth from a river's bottom and banks. These methods deepen and enlarge the channel available for navigation. Until the 1890s, the Corps dredged with dipper dredges, which were draglines and buckets mounted on boats. The buckets were essentially steam shovels operated by chains. The average bucket scooped up about one cubic yard of sediment at a time. Once they brought the sediment to the surface, the buckets deposited it on other boats or barges that hauled it to dumping sites. Engineers considered moving a thousand cubic yards of material to be a "pretty good day's production."[29]

ILLUSTRATION 20. Dipper Dredge.

(Courtesy of the Illinois Department of Conservation)

The final two methods used to improve the Arkansas River in the early eighteenth century were revetments and contraction works. Revetments are facings of a durable material used to protect a wall of earth; they constitute retaining walls that keep bank material from sloughing off into the channel and obstructing it. Contraction works are wing dams or dikes extending from a bank of a river toward the channel. Their purpose is to narrow the channel, thereby increasing the volume and velocity of the water passing through and, hopefully, causing the removal of obstructions to the channel by the scouring action of the river itself. The principles of fluvial hydraulics as related to contraction works, and the initial forms such dikes took, were largely worked out by Major Stephen Long in 1824 and 1825. He based his recommendations on experiments done on the Ohio River under the first rivers and harbors act.[30]

ILLUSTRATION 21. Revetments on Arkansas River.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR).

In 1833 the Corps of Engineers began work on the Arkansas River in accordance with the instructions it had received in the Rivers and Harbors Act of 1832. Lieutenant Thompson Skinner Brown began the first Corps survey of the Arkansas River.[31] This survey produced the first comprehensive picture of the overall situation on the river, although the General Land Office survey of the 1820s included the river and is often used as the earliest bank-line survey for river studies.

In August 1833 Captain Henry M. Shreve arrived to personally oversee snagging on the Arkansas.[32] Unfortunately, the river was too low that fall for Shreve to accomplish much; he reported the removal of only twenty snags. Shreve returned to the Arkansas River on 1 January 1834, and by 22 February he had cleared 250 miles of the river, from its confluence with the Mississippi to Little Rock. Using his famous *Heliopolis*; his second snag boat, the *Archimedes*; three machine boats worked by hand; and the steamboat *Java*, Shreve removed 1,537 snags from the river and 3,370 snags and logs from dry sandbars in the river and along the banks—an average of one snag or hazard to navigation for every eighty-eight yards from the Mississippi River to Little Rock. Some of the snags removed from the Arkansas River during 1833 and 1834 weighed 100 tons, or 200,000 pounds!

Reduced congressional funding slowed the pace of river improvements after 1834, and in 1837 President Van Buren reacted to the nation's first major economic depression following the Panic of 1837 by curtailing federal expenditures. Although Van Buren believed in public construction of internal improvements, he favored state-financed rather than federally financed projects.[33] He also urged that each project be individually evaluated in terms of usefulness and profitable public utility.

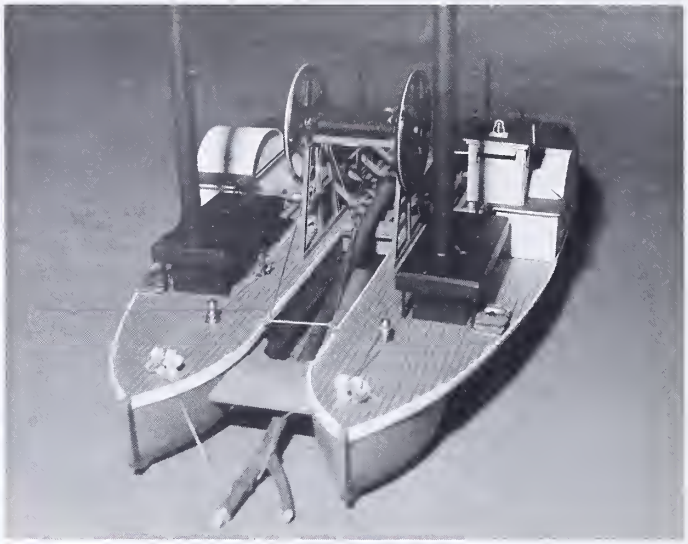


ILLUSTRATION 22. This model of Shreve's snag boat, the ***Archimedes*** *clearly illustrates the design of Shreve snag boats. Shreve used the* ***Archimedes*** *in clearing both the Red River and the Arkansas River during the 1830s.*

(Courtesy of Holice H. Henrici)

Improvements Under the Topographical Corps

In 1838 Congress repealed the General Survey Act of 1824 and, with the same law, created the Corps of Topographical Engineers. The transfer of responsibility for waterway improvement projects from the Corps of Engineers to the Topographical Corps repeated the approach to internal improvements espoused by Andrew Jackson in 1831. From 1838 to 1842 Congress did not authorize any new rivers and harbors projects; from 1842 through 1861 waterway improvement was sporadic throughout the nation. The reasons are many.[34] Proponents of these kinds of programs were hampered by political factionalism, sectionalism, the growing influence of railroads, and the contest for power between the Presidents and Congress. Improvement advocates also found that the argument of military necessity was ignored in this period of relative peace.

President John Tyler signed rivers and harbors appropriations in 1842, 1843, and 1844. The first included a modest appropriation for continued snagging and dredging work on the Arkansas. This work, like all river improvement work from 1842 until 1861, continued to be authorized as military engineering with civil applications.

Then, in 1846, workers on the Arkansas were greeted by news of the long-anticipated war with Mexico. It was not, however, fought in the newly annexed state of Texas' Red River region but near the Rio Grande and areas farther south and west. From 1846 to 1848 the nation's military, including its engineers of all organizations, concentrated its efforts on the Mexican War.[35]

The lull in the Topographical Engineers' civil works activities continued until 1852. In that year, under President Millard Fillmore, Congress passed the only sizable rivers and harbors appropriation made in the period. A very small portion of a $2 million expenditure went towards continued work on the Arkansas River, but the money was spent by 1855. Meanwhile, at the end of 1852 Franklin Pierce was elected President and chose Jefferson Davis as Secretary of War. Davis resisted any extension of federal power, and he and Pierce successfully blocked all appropriations for rivers and harbors improvements. In 1860 the Topographical Corps' Office of Western River Improvements closed.

During the twenty-three years that the Topographical Corps was responsible for waterway improvement, its most significant accomplishments related to the development of the theoretical bases for future projects and a reduction in the cost of removing snags. Only in these years did Army Engineers begin to consider the applicability of improvement methods other than snagging, dredging, revetment, and contraction works. Engineers in France and state and private engineers in the United States were using slack-water navigation systems in the 1830s. These systems utilize locks and dams on rivers to create a series of pools sufficiently deep to permit navigation. However, only in the 1840s and 1850s did American Army Engineers begin to study such methods and technologies for federal projects. Publication of the results of these studies produced an engineering controversy that lasted well into the 1870s. In 1878, after debating the merits of lock and dam navigation systems, the Corps of Engineers began to construct its first experimental lock and dam on the Ohio River.[36]

The Corps also examined the relative value of levees on principal rivers and artificial reservoirs on tributary streams as flood control devices during the Topographical Corps' tenure.[37] Army Engineers did not resolve the controversy over lock and dam navigation systems during these years, but they did reach a consensus on the relative value of reservoirs and levees. An 1861 report recommending that only levees be used for flood control established the theoretical basis for recommendations and planning for the next seventy-five years.[38] It must be noted, however, that it was not until 1916 that Congress authorized the Corps to build levees with the stated purpose of flood control.[39] The levees the Corps built earlier than 1916 were justified as aids to navigation and commerce during periods of high water.

The Topographical Corps also believed in snagging, but after President John Tyler relieved Shreve of his duties with the Corps of Topographical Engineers in 1842, it built no more snag boats on the model of his famous *Heliopolis*. Captain John W. Russell—as legendary a figure on western rivers as Shreve, but a dedicated Whig like President Tyler—assumed responsibility for the Topographical Corps' fleet. Russell, like Shreve, began his career as a keelboatman and flatboatman. Almost as soon as steamboats appeared on western rivers, Russell became a steamboat engineer. He later became a captain, but his greatest renown came from his physical strength and pugnacity. A giant of a man, he was reported to have lifted a 1,614-pound steamboat engine shaft and carried anchors weighing 1,242 pounds across a steamboat deck. The beating he gave Jean Lafitte, the pirate, in a New Orleans brawl was notorious, but no more so than the story of how he hooked his steamboat to a building in Natchez-Under-the-Hill, dragged the building into the Mississippi, and then threatened to pull the whole town in unless money taken from one of his passengers was returned.[40]

The snag boats that Russell had built were bootjack shaped, having single hulls with double bows. Russell chose to build this type of boat because it has a lighter draft and thus could work better in low water when more snags were exposed. The earliest snag boats Russell built continued to use Shreve's snag head. However, beginning in 1845 Russell began to build snag boats with "bow transoms." Designed by Russell in collaboration with snag boat captains John K. Dillingham and Abraham Tyson, these strongly fortified and double-planked, single-hull boats had vertical derricks suspending powerful tackle mounted on the bow. This tackle was powered by the main waterwheel shaft. Instead of ramming snags loose and pulling them up between the hulls or the bows with wheels and windlasses, the new boats hooked themselves to snags with the tackle hanging from the derricks and forced the snags from the bottom by a simultaneous butting and dragging action. These new boats drew even less water than their single-hulled predecessors and were even faster and more economical to operate. The use of these vessels reduced the cost of removing snags from an average of $13 per snag in 1838 to $6.45 per snag in 1845.[41]

ILLUSTRATION 23. U.S. Snag Boat No. 2, 1889. Boot-jack-shaped (single-hulled, double-bow) with bow transom snag boat similar to those built by Russell after 1845.

Reprinted from ***Harpers Weekly****, 1889*

Between 1845 and 1865, when federal civil works activity was low, no innovations occurred in snag boat design. Russell-style snag boats performed the intermittent snagging done on the Arkansas in the period.

Significant improvements occurred in boat technology from 1838 to 1861. Shipbuilders constructed very light-draft steamboats, some specifically designed for the particularly shallow Arkansas River waters.[42] For example, the *Nesho* constructed by Captain Truesdale at Van Buren, Arkansas, drew only thirteen inches of water. The *Know-Nothing*, launched in 1855 by a Little Rock shipyard, drew only three inches when empty and six when full. In 1857, the *Rock City*, also launched in Little Rock, drew only ten inches, despite being a 250-ton, 127-foot-long steamboat with a 28-foot beam and sixteen staterooms. With this sort of ingenuity in design and the Corps' snagging operations, river trade increased in volume, value, and frequency. The boats could also operate for a longer season because they could run during part of the extended low water periods. They could also serve areas beyond the reach of boats with greater draft.

Although waterway improvements were few in the area, the region was not quiet in other ways. Arkansas had become a state in 1836 and had a population of 97,574 by 1840.[43] The California gold rush of 1849 put heavy pressure on both land and water transportation systems in the area. Fort Smith and nearby Van Buren were major takeoff points for thousands heading west to seek their fortune.[44] Then in the years just before 1861 the sectional dif-

ferences between the North and the South began building, eventually affecting Arkansas and southern Missouri as well as the nation.

Combat Services Are Needed

From 1861 until 1865 military engineers of both the North and the South devoted primary attention to their combat missions.[45] Throughout its history, the Corps of Engineers' military mission has included two basic functions: military construction, reconnaissance, and mapping; and combat services.[46]

Both the U.S. Army Corps of Engineers and the Confederate States Engineer Corps performed both basic functions. They provided full military construction and logistic support, including planning, tracing, and constructing fortifications; topographic reconnaissance; and building temporary pontoon bridges, roads, and railroads. They also fought when necessary.

While Confederate engineers did not improve the rivers of the region, control of the rivers in the present-day Little Rock District was vital to the Confederate States of America because these rivers traversed some of the richest cotton-growing territory west of the Mississippi. This area contained some of the most productive cotton-growing land beyond the battlefields. If plantations here could continue to operate and get their product to market, the Confederacy would be enriched. The continuing navigability of these rivers was thus vital to the commercial well being of the South, but little time or money could be diverted to improve them.

The U.S. Army Engineers' military function was paramount also. When war began its staff was too small to do what was required of it. From the single battalion of regular Engineer troops, fifteen of the ninety-three officers resigned to join the Confederate Army. The Confederate Engineer Corps created on 6 March 1861 was short staffed too. It consisted of ten officers and a company of enlisted men. As the war progressed Engineer staff shortages in both armies worsened. Because of their reconnaissance role, Engineer officers and enlisted men were often at or ahead of the front line of battle, suffering high casualty rates. Because of their extensive experience and competence, many Engineer officers from both armies were given field commands. Such Confederate commanders as Robert E. Lee, P.G.T. Beauregard, and Joseph E. Johnston had been U.S. Army Engineer officers before the war, and thirty-three Union generals had formerly served as Engineer officers, including George Meade, Henry Halleck, John Pope, George P. McClellan, and James B. McPherson.

In light of these staff shortages, most front line and vanguard Engineer officers and troop units in both armies were volunteers with prewar construction and civil works or railroad engineering experience. Most behind-the-lines combat support functions were directed by a regular Engineer officer and performed by civilian engineering assistants with hired labor. Fortification construction at the front was generally done by Infantry detachments supervised by Engineer officers. Skilled work was performed by Engineer troop units wherever possible. Most fortifications completed by both armies were earthworks, erected in large numbers on inland rivers, around cities, and in several coastal locations. Engineer troops generally constructed pontoon bridges, roads, and railroads. Engineer officers also supervised the procurement and supply of equipment for these forces.

During the early months of the war Arkansas was in turmoil when the Confederate Army captured Little Rock, forced the Union Army to evacuate Fort Smith, and seized Union shipping on the Arkansas and Mississippi rivers.[47] Meanwhile federal troops retained a precarious control over Missouri.

Large-scale fighting broke out in Arkansas and Missouri in the early spring of 1862 when Major General Samuel R. Curtis, with eleven thousand men under his command, chased the Confederate Army that had infiltrated into Missouri back into Arkansas. The Confederates regrouped and, under Major Generals Earl Van Dorn and Sterling Price, embarked on a counteroffensive that ended at the Battle of Pea Ridge on 7 and 8 March 1862.[48]

During its excursions into Missouri, Price's army was accompanied by Confederate Engineers. The 1st Mounted Engineers under Colonel Henry T. Douglas were a trans-Mississippi outfit headquartered in Alexandria, Louisiana.[49] The defeat at Pea Ridge signaled the abandonment of Arkansas by the organized Confederate Army.[50] However, continuous guerrilla warfare ravaged both Arkansas and Missouri for the next three years.

After its victory in the Vicksburg campaign of July 1863, the U.S. Army had control of the mouth of the Arkansas River and thus effectively controlled the entire river and its drainage. However, the Union armies did not stop there. Operating under the principle of modern warfare extant at the time, the U.S. Army Command believed it necessary to destroy the enemy's economic resources to ensure victory. The Red River campaign of the spring of 1864 was part of General in Chief Ulysses S. Grant's final four-pronged continental attack intended to annihilate totally the economic resources of the South. From March to May 1864, in the Camden expedition of that campaign, the 3d Division under General Frederick Steele invaded the portion of southern and western Arkansas that the U.S. Army had not secured in 1863.

Federal Engineer troops were active in assisting this effort. They erected bridges across the rising Ouachita River, laboriously repaired flood damage, and built pontoon bridges across the flooded Arkansas.[51] This was the same Engineer unit that returned south in May 1864 and built a dam on the Red River near Alexandria, Louisiana, to allow gunboats to pass over the rapids.[52]

During the war improvement of waterways for navigation was neglected. The experiences of the Civil War demonstrated, however, that the division between the Corps of Engineers and the Corps of Topographical Engineers was no longer appropriate. In March 1863 Congress authorized the abolishment of the Corps of Topographical Engineers as a distinct branch of the Army and again placed its personnel and functions under the Corps of Engineer's Chief Engineer.[53]

Civil Works Begin To Be Justified Exclusively on Civil Grounds

The 1863 act returned responsibility for federal waterway improvements to the Corps of Engineers. In 1866 Congress passed legislation that had an immense impact on Corps history and the role the Corps played in the development of the nation. By authorizing the transfer of supervision of the United States Military Academy at West Point to the Army-at-large and by increasing the authorized maximum number of officers allowed in the Corps to 109, Congress created in the Corps of Engineers a revitalized force that could provide any kind of engineering service Congress chose to authorize.

Congress required that the Corps construct not only the wings and dome of the United States Capitol but also the Library of Congress. It told the Corps to maintain the White House and federal parks in the capital, to construct historic monuments around the country, and to build and maintain roads and bridges in the national parks. With these tasks Congress assigned the Corps projects with no military justification.

However, because the war experiences had demonstrated the strategic importance of America's inland rivers, many people continued to view the Corps' waterway improvement projects as military engineering projects with significant secondary civil applications. Virtually no more Corps work was identified for more than seventy years in Arkansas and Missouri as being specifically intended to accomplish the Corps' military mission.[54]

Congress turned its attention to waterway improvements with the Rivers and Harbors Act of 12 June 1866. By this act Congress directed the Chief of Engineers to review all pre-Civil War waterway projects and to plan additional projects of value. Congress appropriated funds to reestablish the Office of Western River Improvements, build a new floating plant, and renew channel-clearing projects on the Mississippi, Missouri, Ohio, and Arkansas rivers.[55] The act initiated a new age of consistent, annual authorizations and appropriations for waterway improvements. The period between 1866 and 1883 has been called the Gilded Age when Congress enacted pork-barrel legislation and significantly increased the volume of Corps work.[56] The Corps of Engineers' annual reports between 1867 and 1884 contain 32,000 pages of detailed information on rivers and harbors projects intended to improve navigation. The pertinent legislation is 260 pages long.[57] The volume of work increased from 42 projects and 26 surveys in 1866, costing $3.5 million, to 371 projects and 135 surveys in 1882, at $19 million.[58]

These post-Civil War waterway improvement projects included the river basins of Arkansas-southern Missouri. After 1866, successive rivers and harbors bills authorized channel maintenance work for the Arkansas, Fourche LaFave, Petit Jean, White, Little Red, Black, St. Francis, Cache, L'Anguille, Current, and Saline rivers. Captain Charles Russell Suter was in charge of these tasks.

ILLUSTRATION 24. CHARLES RUSSELL SUTER

From 1867 until the establishment of the Little Rock office in 1881, Charles Russell Suter of the Corps' Office of Western Rivers was responsible for improvements on the Arkansas River.

(Courtesy of the Department of the Army, United States Military Academy Archives)

In 1867 Captain Suter joined the staff of the Corps of Engineers' Office of Western River Improvements, reestablished by the Chief of Engineers in 1866 with Colonel John N. Macomb as first superintendent. Suter, an 1862 West Point graduate, had served in 1862 and 1863 in the Army of the Potomac. From 1864 until 1866 he was the assistant engineer for the Department of the South. In 1867 Suter joined Macomb's Office of Western River Improvements as officer in charge of improvement work on the Mississippi, Missouri, Arkansas, White, and St. Francis rivers.[59] On 12 July 1870 Lieutenant Colonel William F. Raynolds relieved Colonel Macomb as superintendent. Raynolds and his two assistants, Captain Suter and Captain Charles J. Allen, supervised the transfer of the Office of Western River Improvements from Cincinnati to St. Louis in 1870.

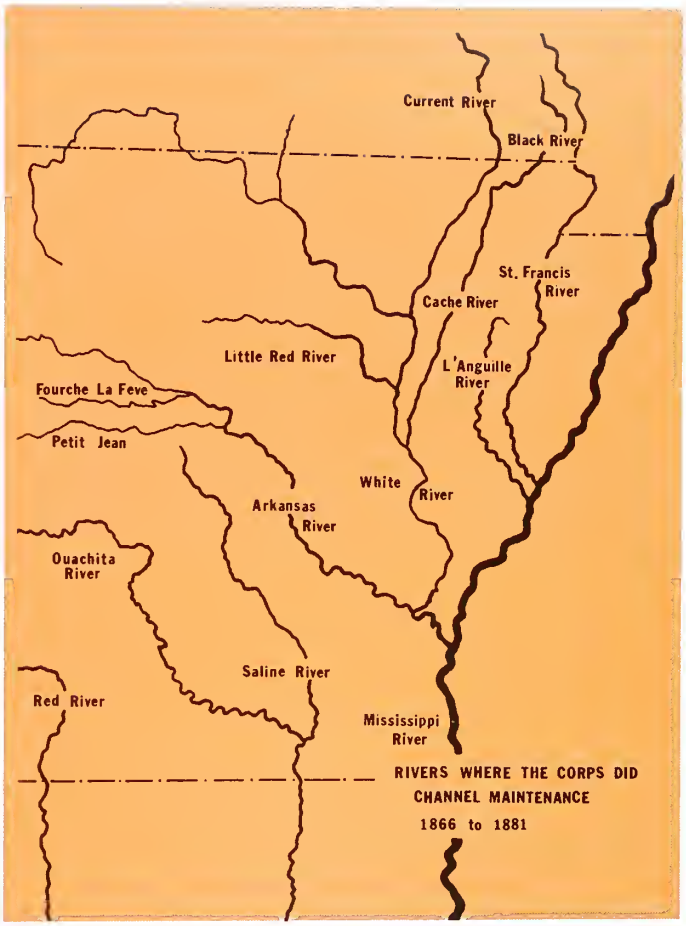


ILLUSTRATION 25. Rivers where Corps did channel maintenance.

The Rivers and Harbors Acts of 1868, 1871, 1873, and 1874 contained appropriations for work on the Arkansas, White, Black, Little Red, and St. Francis rivers. However, except for some surveying work on the Arkansas between Fort Gibson in the Indian Territory and Little Rock in 1869 and on the White River in 1870, snagging and dredging continued to be the only work authorized.[60] Despite the fact that Army Engineers had been actively considering alternate technologies and methods of improving rivers to benefit navigation for nearly twenty-five years, snagging remained the main river improvement technique used by the Corps of Engineers.

Although snagging was a labor-intensive process dependent on specially built equipment, it did not require highly trained personnel and it was a relatively inexpensive way of improving rivers. Highly detailed hydraulic studies and carefully drafted site-specific plans were not needed for snagging to begin, nor was a high degree of engineering expertise or mathematical ability required by those in charge.

The Office of Western River Improvements had four snag boats built between 1867 and 1869. These boats were designed by E.M. Shields, an experienced mechanical engineer hired by Colonel Macomb to study previous snag boat designs. Shields used Shreve's double-hull, twin-boat design. However, he installed three pairs of steam engines instead of the single pair used in the earlier vessels: one pair propelled the boats, the second operated the snag saws, the third operated the capstans and chain hoists. An upright windlass, a capstan consisted of a large spool-shaped cylinder which revolved on an inner shaft. Poles inserted in the capstan were used to turn it to wind and to unwind cable from around the cylinder. This further mechanized snag boat exceeded Russell's improvements, permitted smaller crews, and allowed other savings.[61]

ILLUSTRATION 26. R.E. Derussy

One of four Shields-style snag boats used on the Arkansas River between 1867 and 1870.

(Courtesy of the National Archives)

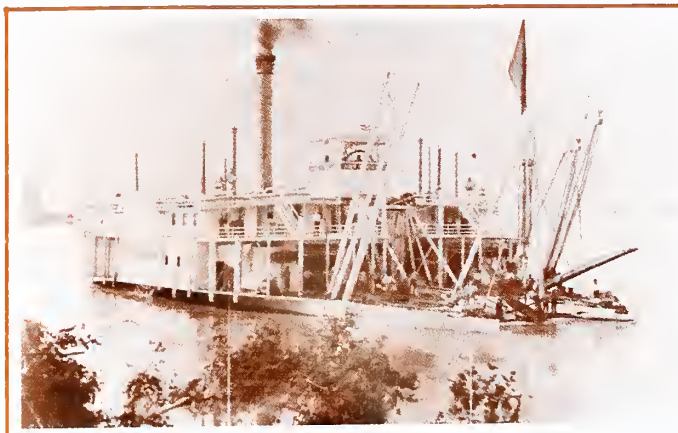


ILLUSTRATION 27. J.N. MACOMB

Charles Russell Suter ordered this, the Corps of Engineer's first iron-hulled snag boat, built in 1874.

(Courtesy of the U.S. Army Engineer District, St. Louis, MO)

Suter used these boats on the rivers in the Arkansas-southern Missouri area for five years, when they were not being used on the Mississippi, Missouri, or Ohio.[62] Then, in 1874, he began arguing for innovative snag boats. Throughout his long and successful administrative career, Suter had a reputation for using the Corps' very latest river improvement techniques.

Immediately after seeing the shallow rivers in his area, Suter began a study of inland river watercraft. He concluded that wooden-hulled snag boats were inadequate for river improvement work. They seldom lasted longer than ten years, and they drew too much water to be effective in the shallow streams and rivers under his jurisdiction.[63] Suter ordered the construction of the Corps' first iron-hulled snag boat, the *J.N. Macomb*.[64] Although a few iron-hulled boats had been built for private companies before 1870, the advantages of iron hulls were not well known.[65] Suter accurately predicted that an iron-hulled snag boat could remain in service for up to fifty years. By lengthening the service life of snag boats so radically and thus reducing the Corps' annual capital investment, Suter dramatically reduced the cost of removing snags.

Moreover, Suter reported that the Macomb drew only two feet, six inches of water: a wooden boat of the same size would have drawn three feet, two inches.[66] This difference was significant on shallow rivers such as those in the Little Rock District.

By 1879 Major Suter retained direct personal responsibility for work on only the Mississippi, Missouri, and Arkansas rivers. Major William Henry Harrison Benyaurd was in charge of the rest of the waterway improvement work in the area. An 1863 West Point graduate, Benyaurd managed bridging operations for the Army of the Potomac from 1863 until 1865. From 1866 to

ILLUSTRATION 28. WILLIAM HENRY HARRISON BENYAURD

Benyaurd was also assigned to the Office of Western River Improvements. He was in charge of improvements on several rivers within the present-day boundaries of the Little Rock District, some of which included the White, Black, and St. Francis rivers.

(Courtesy of the Department of the Army, U.S. Military Academy Archives)

1869 he served as an assistant professor at West Point, and in 1870 he joined the Office of Western River Improvements. In 1874 Major Benyaurd was one of three Army officers and two civilians President Ulysses S. Grant appointed to a special commission to investigate and report on a plan for reclaiming the alluvial valley of the Mississippi River from Cairo to New Orleans.[67] As a member of this commission, Major Benyaurd studied the Mississippi intensively from 1874 until 1879. In 1879 he was also in charge both of the harbors at Memphis, Tennessee, and Vicksburg, Mississippi, and of improvements on the St. Francis, White, L'Anguille, Fourche LaFave, Saline, Black, Ouachita, Yazoo, and Cypress rivers.[68]

By the late 1870s the Corps was doing enough routine continuing snagging work in the area that it authorized both Suter and Benyaurd to build iron-hulled snag boats that would be exclusively assigned to the area. Major Benyaurd's *J.R. Meigs* worked on the White River; Suter's *C.B. Reese*, built in Little Rock in 1879, began work on the Arkansas River in January 1880.[69]

Except for their iron hulls, the *J.R. Meigs* and the *C.B. Reese* were very similar to Russell's single-hulled bootjack-shaped snag boats of the early 1840s. They had wide, flat-bottomed hulls with broad sterns and double bows. The builders mounted Shreve snag heads between the double bows at the waterline.

The boats of the 1870s were modified to accommodate one result of the Civil War and the prewar hiatus in snagging: sunken vessels obstructing the channels of the nation's navigable rivers. Therefore, the new snag boats included a one and one-half ton grapple which the operators dropped on submerged wrecks and dragged back and forth to break up the vessels.[70]

As useful as they were, the *J.R. Meigs* and the *C.B. Reese* could not do all the snagging work Suter and Benyaurd required. For example, the Arkansas River was too shallow above Fort Smith to allow the three-foot-draft, iron-hulled *C.B. Reese* to pass. In 1880 Suter conducted experiments on a fifty-mile reach of the river in Kansas and determined that he would need a specially built, even lighter draft, wooden-hulled scow equipped with a crane to remove obstructions in the upstream reaches of the Arkansas.[71]

Both officers conducted snagging operations on rivers other than the White and Arkansas where they had based their Corps-owned snag boats. For these operations the officers chartered steamers and hired flatboats.[72] When a snag boat that could mechanically pull an entire snag from the river bottom was not available, crews working with hand tools tended to concentrate on cutting away stumps, logs, brush, and overhanging trees in island chutes, on sandbars, and from the banks and on pulling only the most easily extracted snags.

In addition to snagging, contraction works were the other standard Corps' river improvement project in the 1860s and 1870s. However, contraction works were not built in the present-day Little Rock District, partly due to the railroad connection completed on 11 April 1871 between Little Rock and Memphis.[73] By 1872 a railroad stretched from Memphis to Kansas City and then on to Tulsa.[74] Railroad interests had a specific reason in the 1870s to lobby against improvement of parallel sections of the Arkansas River. Arkansas faced other difficulties in river improvements at the time.

Although Arkansas was readmitted to the Union on 22 June 1868, it was not considered "reconstructed" until 3 January 1873 when Elisha Baxter was elected governor.[75] Large outlays of federal dollars for internal improvements specifically benefiting an "unreconstructed" region faced serious congressional opposition in the 1870s. The construction of contraction works was far more expensive than was snagging. Dikes, wing dams, and closing dams required detailed hydraulic studies and carefully drafted site-specific plans before work could begin. The immediate overseers of contraction works needed extensive engineering skills or mathematical ability. The expense of this complex activity proved another reason contraction works were not built.

It is a testament to the importance of the rivers in the region that Congress authorized the Corps of Engineers to conduct any waterway improvement projects in unreconstructed Arkansas. In most such areas the only improvements were those made by the rivermen who conducted the region's waterborne commerce. These rivermen were strained by the altered economic conditions created by the development of railroads. The rivermen's primary response to railroad competition was the post-Civil War development of the barge system. This system guaranteed greater economy and efficiency in river commerce.[76] The barge, which carried most of its load above the waterline, was a particularly important innovation on shallow rivers such as the Arkansas. A single, very-shallow-draft towboat could move a large number of equally shallow-draft barges lashed together. Such a group of vessels had a greater cargo capacity than even the largest steamboats. Moreover, the use of barges gave riverborne commerce a railroad-like flexibility unavailable when cargo had been carried on steamboats. Barges, like railroad cars, could be added or dropped at points along the way without great delay. But even with the innovation of barging, use of the river depended on the economy.

Only after Reconstruction did the postwar southern economy begin to recover and grow with any vitality.[77] For example, in the years just before the Civil War, cotton production averaged about 4 million bales, much of which was moved by water. After the war, the former Confederate states did not enjoy a 4-million-bale year until 1870, and only after 1874 did the crop begin to consistently top that figure. The prewar production record of 5.3 million bales was not broken until 1879. Only as this economic revitalization was fully under way was there a concomitant boom in transportation and an increase in pressure for waterway improvements in the agricultural South.

This economic revitalization was reflected in Arkansas, which experienced its greatest growth since the introduction of cotton growing. Between 1870 and 1880 the population more than doubled.[78]

Simultaneously, traditional local leaders began to reassume political control and lobby for specific regional improvements. Their effectiveness in the national Congress grew following the Compromise of 1877, which gave Republican Rutherford B. Hayes the victory in the disputed presidential election of 1876.[79] One of the specific issues that persuaded southern Democrats to support Hayes was his avowed support of internal improvements. In the present Little Rock District, the improvement of the Arkansas River was an important issue.

The First Contraction Works

The Corps of Engineers built its first contraction work on the Arkansas River in 1878. This seventeen-hundred-foot brush and stone dike was designed by Major Suter to slough away a sandbar in front of the Fort Smith landing, thus improving the navigability of that reach of the Arkansas.[80] Then, in 1879 and 1880, Major Benyaurd built seven stone spur dikes on the White River between Jacksonport and Buffalo Shoals.[81] These dikes concentrated water over the shoals that made navigation difficult. By narrowing the channel and concentrating water in these

shallows, the seven dikes were to wash the obstructions away or failing that, increase the depth of water over them to a navigable level.

While Benyaurd was doing this work on the White River, Congress authorized the Corps to begin another survey of the Arkansas from Fort Smith, Arkansas, to the mouth of the Little Arkansas at Wichita, Kansas.[82] Congress intended this project to serve as a basis for subsequent improvements to aid navigation.

In 1879 Congress also authorized the Corps to act to save Pine Bluff. Approximately forty-five feet high, Pine Bluff is located downstream of Little Rock at the outside edge of a sharp bend in the Arkansas. By 1879 the erosion of the bank was so great that valuable properties in the city were undermined and caving into the river. At the same time the river was threatening to straighten its course by cutting through the land behind the city at Yell's Bend about four miles upstream. Such an occurrence would have left the city of Pine Bluff miles away from the Arkansas River. In February 1880, Major Suter submitted his plan to Congress and work began on the revetment of the banks in front of the city and at Yell's Bend. Suter also began construction of a wire curtain dike to direct the water to continue in the channel on its old course around Pine Bluff.[83]

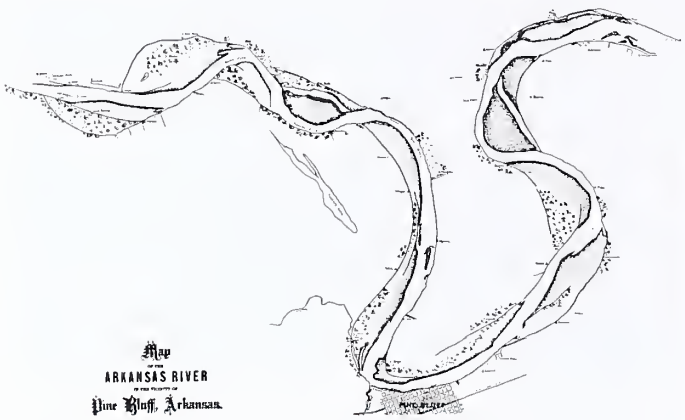


ILLUSTRATION 29. Map of Corps of Engineers' 1880-1882 work at Pine Bluff.

Reprint from U.S. Army, Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1881.*

The banks of the Arkansas, like those of the Mississippi, are alluvial, composed of silt, sand, clay, mud, and debris carried and dropped by the running water of the river in the course of its drastic fluctuations. Alluvial banks are particularly given to cave-ins and erosion. Caving and eroding are even worse on concave bends in alluvial rivers because it is at these points that the current strikes the bank head on. At Pine Bluff the subsoil of the river's bank is sandy and "quickly eaten away when it comes into contact with the river. It becomes a quicksand-like substance that caves into the river bringing the clay topsoil down into the river."[84] The rapidly rising water characteristic of the river at Pine Bluff exacerbated the problem.[85]

The dike the Corps built at Pine Bluff was innovative. In 1879 Corps officers had begun experimenting with permeable dams or dikes as opposed to solid structures.[86] Their experiments were revolutionary. The St. Louis Corps staff, including Suter, began building "dikebuilders, rather than dikes."[87] These structures extended the principles of fluvial hydraulics used by the Corps since 1824. The permeable structures that the St. Louis office of the Corps introduced in 1879 allowed the river not only to modify itself but also to provide the materials for its channel contraction. The permeable structures caused the river to leave its silt in places where the accumulation would act as a contraction dike.

Although traditional "impermeable" stone or stone and brush dikes allowed some water to pass through, the amount of water was too small for significant deposits of silt to form downstream from the dikes. The stone dikes Major Benyaurd built on the White River in 1879 and 1880 and the brush and stone dikes that Suter had built at Fort Smith in 1878 were examples of these kinds. The permeable barriers the Corps officers based in St. Louis began to design in 1879 allowed virtually all a river's water through. They simply slowed it sufficiently so large amounts of silt would settle behind the barrier, thus "building" a dike. The Corps could construct these new permeable barriers for considerably less money than traditional dikes. In 1879 it cost the Corps $9.75 per linear foot to build a stone dike and 80 cents per linear foot for one of the new dikebuilders.[88]

In 1880 Suter designed an eleven-thousand-foot L-shaped curtain dike to help protect Pine Bluff. His concept extended the idea of an inexpensive permeable barrier one step beyond that promoted by his office mates in 1879.[89] Their first permeable barriers were hurdles constructed by driving a double row of piles into the river bottom. The builders left a few inches between each pile in a pair and spaced the pairs about five feet apart. They then joined the tops of the pairs by horizontal pieces. Laborers interwove willow brush horizontally between the piles and inserted vertical branches to fill any large holes.[90]

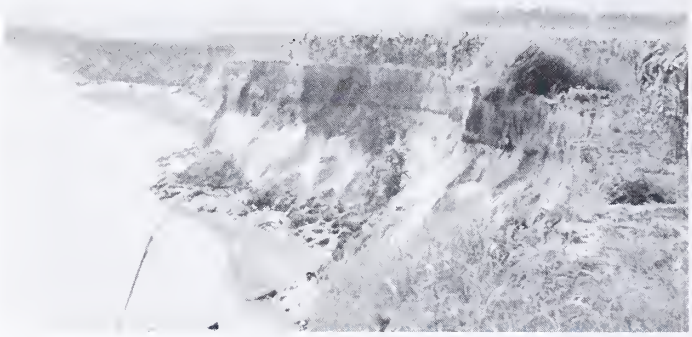


ILLUSTRATION 30. Eroded Arkansas River bank at Pine Bluff.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR).

ILLUSTRATION 31. An effective permeable dike results in an accumulation of drift above the "dikebuilder" and a deposit of sand below.

(Courtesy of the U.S. Army Engineers District, St. Louis, Missouri)

Suter's curtain dike also involved driving a double row of piles at intervals along its entire length. However, unlike the hurdles, his builders left six feet between each pile in a pair. They then crossed the two piles in each pair near the top and fastened them together. The crew spaced the pairs at about twelve-foot intervals and joined them at the level of the cross by a horizontal piece. Laborers constructed a continuous wire mesh curtain in the river on a flatboat moored at right angles to the line of paired piles. The curtain dike boat was fifty feet long and twelve feet wide with guards two and one-half feet wide. The flatboat crew used a skeleton drum on the boat to make the continuous wire netting. Workers then inserted branches and sticks into the netting. They lowered this curtain into the water and attached it to the top of the piling structure. Anchor weight kept the lower edge of the curtain in place. The weights consisted of gunnysacks filled with sand.[91]

Suter's theory was that once this curtain was emplaced it would check the velocity of the water to such an extent that suspended matter would be deposited. The accumulated sediment would, in turn, force the main current of the Arkansas River toward the center of the channel and thus relieve the eroded bank. To prevent erosion of the existing bank in front of the city and the bank upstream at Yell's Bend, Suter designed a system of bank revetments that used much of the same technology as his curtain dike.[92] Suter's two mattress revetments also were constructed in the river on a flatboat, this one moored beside the stretch of bank Suter wanted to protect. The mattress boat was eighty feet long and sixteen feet wide with guards three and one-half feet wide. The boat contained a system of inclined ways, a working platform, and a skeleton drum. Continuous wire netting was fed through the ways after it had been twisted over the drum and enmeshed with hardwood branches. The resulting eighty-five- to ninety-foot-wide mattress was then held against the bank by rocks.

Neither the Pine Bluff construction nor the Arkansas River survey project was complete by the beginning of 1881. These projects represented a greatly expanded level of Corps involvement with transportation, particularly river improvement, in southern Missouri and Arkansas. As the fortunes and responsibilities of the Engineers waxed and waned nationally from 1820 to 1881, so had they in this region. A new phase of U.S. Army Corps of Engineers involvement was about to begin with the establishment of a permanent Little Rock office. This marked the beginning of a new era of Corps operations that were even more responsive to the needs of the region's citizenry.

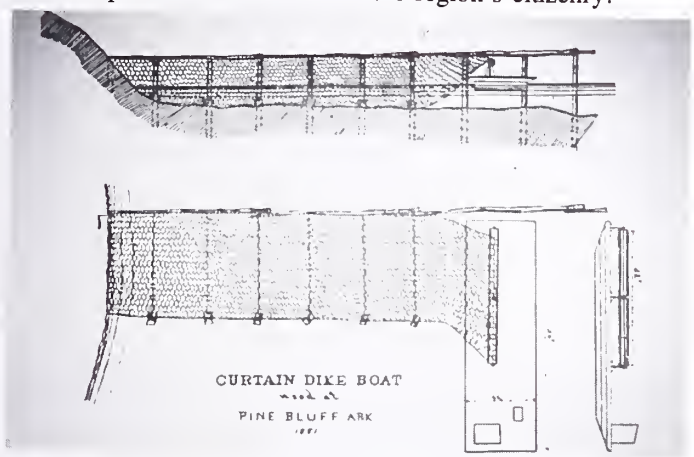


ILLUSTRATION 32. Curtain dike boat

Reprint from U.S. Army, Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1881.*

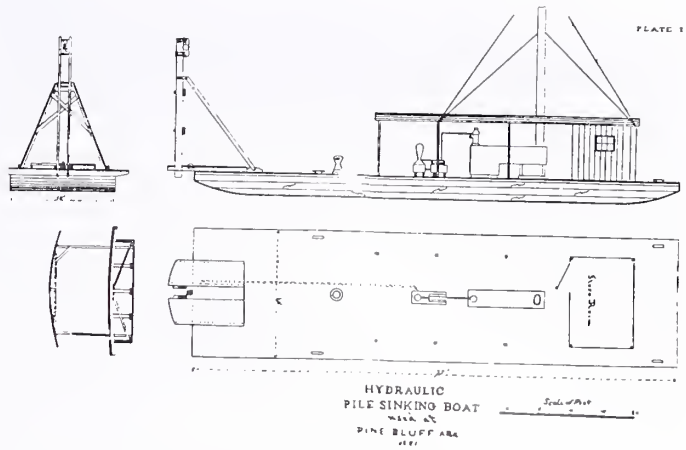


ILLUSTRATION 33. Hydraulic pile sinking boat

Reprint from U.S. Army Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1881.*

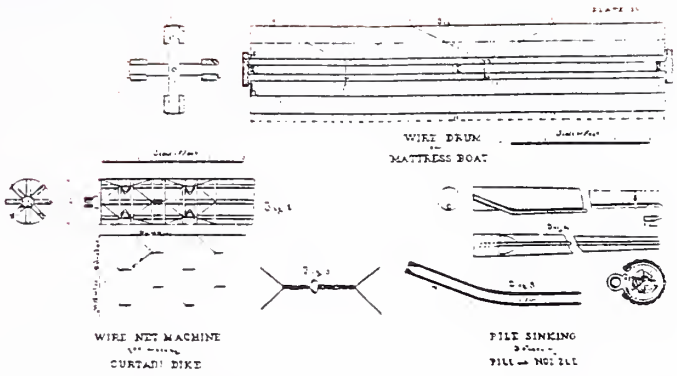


ILLUSTRATION 34. Wire net machine

Reprint from U.S. Army Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1881.*

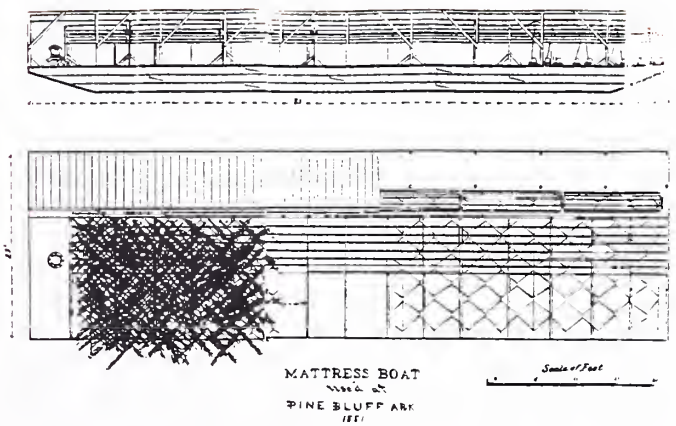


ILLUSTRATION 35. Mattress boat

Reprint from U.S. Army Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1881.*

ILLUSTRATION 36. 1881 photograph of Little Rock District employees making mattress to protect the bank at Yells Bend.

(Courtesy of the U.S. Army Corps of Engineers, Little Rock District)

Chapter III

Improvements in the Arkansas and White River Basins, 1881-1898

As the nineteenth century drew to a close, the officers in charge of the newly created Little Rock office had important decisions to make. Economic conditions, modes of transportation, and the needs of the area were changing, forcing the officers to concentrate their resources for maximum benefits.

Majors Suter and Benyaurd faced some of these decisions; their successors faced even more Major Suter worked on Pine Bluff's problems concurrently with a major Mississippi River construction plan. In 1879 Congress established the Mississippi River Commission.[1] Suter was one of seven members of this commission and helped draft its first report. The 1880 report called for construction of a complete system of levees for the Mississippi River from Cairo, Illinois, to New Orleans, Louisiana, and for construction of channel improvements from Minneapolis to New Orleans.

Faced with the imminent implementation of this plan, the Corps freed officers with major Mississippi River commands of certain other significant responsibilities. Major Suter was one of these officers, as was Major Benyaurd, the officer in charge of two of the most important harbors on the Mississippi: Memphis and Vicksburg.[2]

Major Benyaurd had established himself as one of the nation's leading Mississippi River experts. He had intensively studied the river for five years as a member of the special presidential commission, that preceded the Mississippi River Committee. Benyaurd's expertise would be needed in the implementation of the Mississippi River Commission's 1880 plan.

Not only were Majors Suter and Benyaurd's heavy work loads expanding, but the Corps' activities in Arkansas and southern Missouri were increasing in tempo and volume as well. Therefore, waterway improvement projects in this geographic area were reassigned from Suter and Benyaurd to a new officer.

On 1 February 1881 Captain Thomas Henry Handbury was a forty-year-old West Point graduate with fifteen years' experience as a government engineer.[3] One of 109 professional soldier-engineer officers under the command of another professional military engineer, the Chief of Engineers, he assumed officer-in-charge responsibilities for a collection of Corps of Engineers waterway improvement projects in a wide geographic area.[4] This region stretched from Wichita, Kansas, to just across the Mississippi River from Memphis, Tennessee, and from the Ozark Mountains of Missouri south to the Louisiana border. He assumed from Major Suter responsibility for work along approximately one thousand miles of the Arkansas River. From Major Benyaurd he assumed responsibility for projects on nine other rivers: the White, Black, Current, Cache, St. Francis, L'Anguille, Bay, Fourche LaFave, and Saline. Handbury inherited nineteen ongoing projects in all.[5] Within thirty-two days of his appointment, Congress authorized work on the Little River and assigned it to him.[6]

Corps Organization and Administration in 1881

Although Handbury opened the first Corps of Engineers' office in Little Rock in February 1881, it cannot be said with accuracy that the Little Rock District began with his appointment. In 1881 there were no Districts in the Corps of Engineers. At that time the Corps organized civil works around projects under examination, construction, or operation. It grouped these projects in clusters based on the officer in charge of them. As is obvious from Captain Handbury's case, the Corps placed more than one project under the same officer.[7] Only after 1893 did the *Annual Reports of the Chief of Engineers* identify the collections of projects under the charge of individual officers as Districts and give the officers in charge the title of District Engineer.[8] The Corps did not name the Districts until later, and only in 1913 did the Corps begin to define them in terms of the geographic area controlled rather than in terms of the collection of projects supervised.[9]

Captain Handbury assumed a job that, although large, was manageable. He was already familiar with the projects in his charge. He had just spent nearly three years as an assistant engineer in the Corps' St. Louis office, the office that, at the time, had responsibility for all the Corps' Arkansas River snagging, survey, and improvement work. While he served as an assistant engineer there, the Office of Western River Improvements also supervised the work on the other rivers of the region for which Major Benyaurd was responsible. Moreover, in his new position Handbury still had the benefit of Major Suter's fourteen years' experience with the projects in the area. As officer in charge Captain Handbury remained under Major Suter's command, and Suter, concurrently with his other responsibilities, remained with the Office of Western River Improvements.[10]

Handbury, a small staff of clerks and draftsmen, and a few assistant engineers managed the Corps' projects. Handbury's staff

was stationed at Little Rock, at the project management office which he opened in late March 1881 in Pine Bluff, or at a work site.[11] Actual project work was generally done by government-hired labor drawn from the local area, although much was done by private contractors.

In 1881 the administrative work of the Corps of Engineers was simpler than it is now. Consequently, the services and functions of the Corps were less numerous, varied, and complex than they are today. The Corps was only authorized to improve waterways as it benefited navigation. Other applications of a project, such as flood control, could not be used to calculate its benefits. Moreover, Congress defined improvements for navigation very narrowly in 1881.[12] Thus only a small administrative staff was necessary.

Captain Handbury had ultimate leadership responsibility for projects under his command. He served not only as a general manager, administrator, and decision maker, but also as an engineering decision maker. Despite the fact that since 1824 the Corps has relied on civilian experts, hiring consultants or contractors for engineering expertise in its waterway improvement projects, Handbury was responsible to his superiors and to the Congress for projects carried out by his subordinates. It did not matter whether his subordinates were Army officers or enlisted men, civilian staff, or government-hired consultants, contractors, or laborers.

In Handbury's day his office, as all local Corps offices, was a focus for Corps of Engineers' waterway improvement project planning, construction, and operations activities in the area under his charge. With the 1838 repeal of the General Survey Act of 1824, no Army engineering organization nor any individual Engineer officer could initiate projects.[13] Once a project was initiated, however, individual officers in charge in the 1880s had (as did District Engineers in the 1980s) a large and direct involvement in the waterway improvement process.

The 1880 waterway improvement process resembled today's. When a local navigation-related problem arose, local people would contact their elected representatives for help. If the citizens and the politicians saw the navigation problem as appropriate for the Corps of Engineers, they would begin to secure the support of the Corps and to get the problem area included in the first section of the next rivers and harbors act.[14]

Once Congress authorized the project, the officer given responsibility for it arranged to have the current conditions and existing commercial use along that part of the waterway examined by his direct subordinates or an outside contractor. The resulting report recommended whether further action by the Corps would improve the problem and whether such action was advisable. While this preliminary examination was being conducted and the report prepared, the designated officer in charge was the contact point for area people concerned with the issue. He was the first court of appeals for people dissatisfied with lower-level decisions and the arbitrator among special interest groups.

In Handbury's day, handling this point position was not easy. An officer-in-charge's career and reputation were often in danger. If he displeased certain interest groups or individuals he could lose his job; his judgment was often publicly questioned in personal terms. America was in the heart of its so-called Gilded Age when federal government action was perhaps more blatantly and obviously ruled by politics, both banal and partisan, than at any other time in history.[15] Although the Pendleton Act, passed during Handbury's tenure as officer in charge of the projects that would later make up the Little Rock District, created a Civil

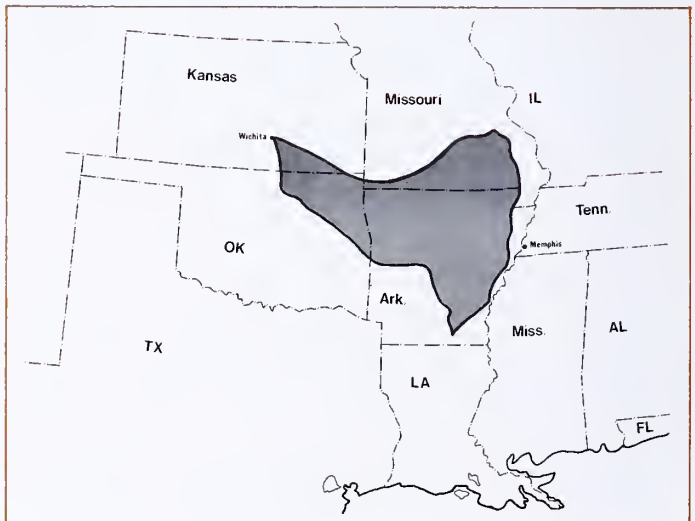


ILLUSTRATION 37. Area through which projects under Capt. Handbury's charge were spread in 1881.

ILLUSTRATION 38. Drawing of Little Rock, Arkansas, about the time Captain Handbury opened the first Corps of Engineers office there. View from the opposite bank of the river. Drawing by Alfred Rodolf Ward (1828-1891).

(Courtesy of the Historic New Orleans Collection, Acc. No. 1977.137.9.7.)

Service Commission, it did not protect him from the anger of thwarted groups. The newly created commission was empowered to protect only about 10 percent of the employees then at the mercy of the federal patronage and pressure system. Army officers were not covered in the act.

Once the officer in charge made his decisions, arbitrated among groups, and was satisfied with the examination and survey report, he sent it to the Chief of Engineers via the chain of command. In 1881 the chain of command went from Captain Handbury to Major Suter in St. Louis.

Because Handbury was the officer on the spot and had the most direct knowledge of the situation, it appears probable that Suter was likely to accept Handbury's recommendations and conclusions unless they seemed unexpected or unconventional enough to require further explanation. Suter, as the second court of appeals, could question Handbury if he received a reasonably valid complaint. If neither situation occurred, considering the extent of Suter's work load and responsibilities, it is not surprising that he did not acknowledge Handbury's transmissions. Major Suter would review the report and if he had no questions or comments would send it on to Lieutenant Colonel John G. Parke. Parke was the officer in charge of the 3d Division of the Office of the Chief of Engineers.[16] The 3d Division surveyed and improved rivers and harbors and was in charge of public buildings and grounds, including the Washington Aqueduct.

Parke and his staff were unlikely to comment unless the report contained truly unexpected information or conclusions or could be politically explosive. Then Parke or his staff would question Suter and Handbury and apprise the Chief of Engineers of the report's content. Considering the volume of reports coming into the office, it is unlikely that the Chief actually dealt with all the routine reports that flowed in from the field, except those called to his attention by his staff, a congressman, or a private individual.

The Chief of Engineers also served as a board of appeals for those dissatisfied with lower-level decisions. In fact, by 1881 the primary function of the Chief of Engineers and his staff had come to be one of mediator among the Secretary of War, Congress, special-interest groups, and individual officers in charge.[17] The Office of the Chief of Engineers also became, as it is today, the clearinghouse for congressional directives, the office ultimately responsible to the Secretary of War, the President, and the Congress for projects carried out by all Corps units, employees, consultants, and contractors regardless of their place in the hierarchy.

When a report was accepted by the Office of the Chief of Engineers, it would be forwarded to Congress, usually as part of the Chief of Engineers' annual report. The Chief's superiors would likely be informed of the detailed content of a particular report only if political reaction was expected. The Chief of Engineers' immediate superior was the civilian Secretary of War, a member of the President's cabinet.

Following its own review of the Corps' study of a waterway or site, Congress could instruct the Corps to perform detailed surveys and prepare plans including cost estimates. The officer in charge not only supervised this work but also served as the point of contact for politicians and special-interest groups interested in the improvement. He passed his recommendations, designs, and estimates up the same chain of command; his superiors reviewed them as they had the preliminary reports; and the Chief of Engineers sent them to the Congress. If, after review, Congress accepted the plans, it might authorize implementation and appropriate funds.

The officer in charge was then made responsible for actually doing the work. Because of this responsibility, and the Corps' tradition of responsiveness to local political pressures, the officer in charge in the 1880s had to have a high degree of authority and latitude to establish the priorities for the work under his jurisdiction and to select the methods used to do it.

Work Begins

In late March 1881, when Handbury was actually ready to get down to engineering, his twenty-project work load fell into three basic categories: snagging and dredging, examinations and surveys, and construction. Half of his projects consisted of snagging and dredging.[18] Just as in 1833 when the Corps initiated its first work on the rivers within the District's boundaries, snagging and dredging remained the main river improvement techniques used by the Corps of Engineers on all of its projects.

ILLUSTRATION 39. Twin snags drawn onto the butting beam of a snag boat for sawing.

(Courtesy of the U.S. Army Engineer District, St. Louis, MO)

Snagging was a major operation. Snag boat work remained strenuous and dangerous in 1881; accidents and water-related diseases were accepted occupational hazards. Many men were seriously injured or died in service on snag boats; others suffered from cholera, typhus, influenza, or malaria.[19] Accidents involving the machinery included not only maiming injuries and deck-top deaths, but also drownings. Requests for medicine frequently appear in correspondence between the officers in charge of early Corps projects in Arkansas and Missouri and the Office of the Chief of Engineers.[20] Arguing that snag boat officers and men were "employed on duties as exposed, as hazardous, and often as fatal, as the vicissitudes of a campaign," the Chief of Topographical Engineers once recommended that "like the wounded and disabled soldier receives a pension proportioned to the injury he has received," so should they.[21]

The human toll of the work had a direct impact on the effectiveness of the Corps' operations beyond the obvious tragic and direct impact it had on the men themselves. As Captain Henry S. Taber (Handbury's successor as officer in charge of much the same group of projects Handbury had had responsibility for in 1881) explained to the Chief of Engineers, "Since 1833, snag boats have removed timber from the channel and banks of rivers. Malarial influences and other causes have operated to make some of the work ineffective, due to the difficulty of keeping experienced men at it."[22]

Even for men free of serious injury or debilitating illness and who stayed on the job, the financial rewards of the work were small considering "the sufferings and privations attending a confinement" on a western river "at that season of the year when

the business must be attended to.'' These sufferings and privations were well known to ''every gentleman from the South and West'' and included not only illness, but also mosquitoes and extreme heat.[24]

Naturally, crews attracted to such work were rough and tough and hard to handle though they described themselves as generally happy-go-lucky and prone to horseplay. Following in the tradition of the physically strong and short-tempered Captain Shreve, snag boat officers were known well into the twentieth century for being stern taskmasters who often assumed responsibility for the education and morals of young crewmen. By 1925 the average age of crewmen on snag boats in Arkansas and southern Missouri was nineteen or twenty years.[24]

By Handbury's day the size of crews had, however, diminished considerably from Shreve's day. In the 1830s Shreve commonly employed as many as six hundred men and six boats on a single river during the low-water working season. By the 1880s only one snag boat was frequently in service at a time on any one river, and it might employ a crew of only fifteen or so.[25] This reduced force was possible because once the initial channel-clearing effort had removed hundreds of years of accumulation, the job facing subsequent snagging crews was much smaller. During Shreve's initial 1833 and early 1834 work on the easternmost 250 miles of the Arkansas River, his crew pulled individual snags weighing up to 100 tons each. During 1880 and early 1881 Suter's and Handbury's crews pulled only an aggregate of 17,347 tons of snags from the entire easternmost 500 miles of the river.[26]

Despite this reduction, snagging remained necessary. In fact, it would continue to be necessary on the Arkansas for another eighty-some years, into the late 1960s.[27] The Corps continually cleared snags from the Arkansas River for nearly 120 years, not only because snags perpetually flowed into the Arkansas from its tributaries or became deposited there when the Mississippi River's waters annually backed up into the Arkansas, but also because snags continued to tumble into the river from the Arkansas' banks.

Alluvial banks are particularly given to cave-ins and erosion. As early as 1832 Shreve and other Corps officers realized that in rivers such as the Arkansas, once the initial clearing—removing hundreds of years' worth of snags —had been done, it would be far less expensive to prevent snags by felling trees on the riverbanks than it would be to remove snags in the water.[28] Shreve advocated ''cutting down all the timber from off the banks of the river at all places where they are liable to fall in, from three to four hundred feet from the margin of the river; in doing this, the first cause of the obstructions would be removed, and the banks of the river will be preserved.''[29] With no trees along the banks, trees would not topple into the rivers when the banks caved in. Insofar as appropriations would permit, the officers who succeeded Shreve on the Arkansas followed a modified version of his policy. They cut down trees that appeared in imminent danger of falling, but they also had to continue snagging.[30]

Although by 1881 some Corps officers were beginning to advocate other even more radical approaches to the prevention of snags by the stabilization of alluvial river banks, Handbury and his successors continued to follow the modified version of Shreve's policy in use along the Arkansas River since 1834.[31] By 1883 Captain Handbury was spending $36,000 a year snagging and cutting trees from the Arkansas' banks.[32] This was the equivalent of spending nearly $417,000 a year in 1986 dollars.[33] As Major Milton B. Adams, Handbury's immediate successor, said in 1884, ''One of the main problems'' continuing to confront the snag boats operating on the Arkansas ''was the removal of trees that had fallen into the river as a result of erosion.''[34] This problem remained paramount for the Arkansas River for many years. The reports of Lieutenant William L. Sibert, Little Rock District Engineer from 1894 to 1898, have frequent comments concerning ''the ever present problem of caving banks'' and the related ''never ending process of snags reappearing.''[35] The next forty-four District Engineers continued to submit similar reports.

Because of the ''increasing need for the [Arkansas] river to be used for commercial'' purposes, Captain Handbury argued throughout his tenure as officer in charge that he needed many more new and improved snag boats than he had the money to build.[36] On 13 April 1881 Colonel Parke, acting on behalf of the Chief Engineer, authorized Handbury to build the light-draft, wooden-hulled crane boat that Suter had suggested be built to remove obstructions from the upstream reaches of the river between Fort Smith, Arkansas, and Wichita, Kansas.[37] In September 1882 the *Wichita* was completed at Little Rock and put to work above Fort Smith.[38] Captain Handbury kept the *C.B. Reese* working between Fort Smith and the confluence of the Arkansas and Mississippi rivers and in 1882 moved the *J.R. Meigs* from the White River to the Arkansas to assist in this work.[39] Thus most of the government-owned snag boats were kept busy on the Arkansas River, and the rest of the snagging work was done with hired boats. This pattern was adhered to by Handbury's successors. In the early years this was because the Corps saw the Arkansas as the most important river in the region. In later years when the Corps began to emphasize other rivers of the region, snagging was a less common technique. Snagging and dredging remained the Corps' main improvement methods on the Arkansas until the 1960s.

Dredging, of course, also remained necessary during Handbury's tenure as District Engineer. The Corps, in fact, continued to dredge rivers in the region for another 105 years. This work was particularly important on the silt laden Arkansas River. Draglines and dipper dredges remained the only machines used for dredging on inland waterways throughout the country until the 1890s when hydraulic dredges were introduced. These new dredges sucked the sediment to the surface, where it was placed on barges to be hauled away. By the turn of the century floating discharge pipes were developed. These pipes allowed the dredged material to be carried directly to a shoreline fill area or a dumping site outside the channel.[40] Despite the introduction of hydraulic-powered machines, dipper dredges continued to be used and improved.

After snagging and dredging projects, the next largest number of projects in Captain Handbury's work load were examinations and surveys. This is not surprising considering that during the late nineteenth-century heyday of pork-barrel projects Congress authorized the Corps to survey and evaluate as a benefit to commercial navigation the merits of improving all but the smallest streams. Streams that a person could walk across at their mouths without getting wet feet were surveyed for possible navigation projects.[41] The Chief Engineer was forced to admit at one point that the Corps could not follow Congress' orders to survey one particular stream because, despite a diligent search, the Corps could not find any such river.[42]

None of the rivers surveyed and examined in Handbury's area of responsibility were that small. The smallest was the Bay River, a tributary of the St. Francis, and it was only surveyed because the Corps was simultaneously surveying and evaluating the merits of improving the St. Francis for commercial navigation.[43] The St. Francis is a major stream that drains very fertile cotton land and in 1881 supported considerable commerce. H.L. Koons, a civilian contractor, first investigated it for the Corps in 1870,

and snagging operations were initiated in 1874.[44] Congress refused to appropriate money after an initial allocation; thus the snagging operations ceased after a few months.[45]

Corps examinations and surveys such as these were not limited to determining exact locations or boundaries. In the 1880s, as today, this work included the entire investigative process to decide whether the Corps could do anything to improve a specific local problem and whether such action would be advisable and appropriate. It also included the selection of methods for solving the problem and the preparation of detailed plans and cost estimates for implementing these plans.

Since the Corps became engaged in river improvements in 1824, its first step to formulate an improvement program for any river has always been to survey current conditions and existing commercial use. It produces a comprehensive report on the situation and suggests improvements on the basis of its comprehensive report.

Although the surveys of the 1880s and even much later lacked sophisticated methods of evaluating data, early Corps survey reports from all areas of the country contain a wealth of information. During the 1883 navigation season on the St. Francis, the survey report showed that 20,000 bales of cotton, 30,000 sacks of seed, 1,000,000 feet of walnut timber, 1,000 sacks of corn, and unspecified amounts of livestock and wood shingles were brought down to the Mississippi.[46] The value of the cotton alone exported in 1883 was about $1 million, a significant amount in terms of the 1880s' American economy.[47] The value of the miscellaneous produce, dry goods, and so forth imported via the St. Francis that year was $200,000.[48]

Another 1880s survey was of the Cache River. Although a tributary of the White River, the Cache is itself a major six-hundred-mile-long river.[49] It drained fertile cotton land and had been carrying so much commerce for so long that the 1880-1881 survey was not the first time the Corps of Engineers had seriously considered improving it. As early as 1871 the Office of Western River Improvements had conducted a survey of the Cache and determined that its improvement would benefit navigation.

In 1871 the Current River had also been examined by the Office of Western River Improvements.[50] The Current too is in the White River basin; it flows into the Black River, a major tributary of the White. The 1880-1881 survey reported that the exports along the Current were mainly pine lumber, wheat, corn, and some cotton from Missouri and lumber from Arkansas.

Handbury was responsible for surveying a third White River basin river, the Little Red. It also traversed fertile cotton country from Searcy, Arkansas, on its course to the White River. In 1882 Searcy shipped ninety-eight hundred bales, worth nearly half a million dollars in 1882 dollars.[51] However, navigation was not practical as far upstream as Searcy in 1882, and other means had to be used to bring the cotton out.

Despite the importance of the commerce in these basins, the most important examination and survey work under Handbury's charge took place on the Arkansas River. The commercial potential of the Arkansas dwarfed any other river in the region; it was the major river flowing through some of the nation's most fertile cotton land. In its more western Arkansas reaches, it flowed through lumber and coal fields. Still farther west in Oklahoma, Kansas, Texas, New Mexico, and Colorado the Arkansas River basin encompassed some of the nation's most productive cattle and wheat-growing country, and it reached out into important mineral-rich lands. However, during the nineteenth century the quantity of goods carried on the river below Little Rock always exceeded that carried above Little Rock.[52] In 1885 Captain Taber estimated the commerce in cotton from just above Little Rock to the Mississippi to be from eighty to one hundred thousand bales. This quantity of cotton was worth $4 million or $5 million in the 1880s, an amount which had the same purchasing power as between $46 million and $58 million in 1986.[53]

The importance of the Arkansas River had long been recognized. In 1833 Lieutenant Thompson Skinner Brown began the first survey of the Arkansas from the confluence of the Grand River in the Indian Territory to the Mississippi River in that year. In 1869, Colonel John N. Macomb, superintendent of the reestablished Office of Western River Improvements, instructed civilian engineer Sylvanus Thayer Abert to resurvey the Arkansas' reach between its confluence with the Grand and Little Rock.[54] That was the only totally unimproved section of the river below the Grand. Since Captain Shreve began snagging in 1833, the Corps had been improving the Arkansas between Little Rock and the Mississippi intermittently. Work ceased during the Civil War. Only in 1870, after Abert's survey had been ongoing for a year, did the Corps resume an improvement program on the Arkansas River.

ILLUSTRATION 40. Little Rock Waterfront in 1885.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Congress did not authorize another survey of the Arkansas River until 1879. By then Reconstruction was over and local political forces had once again begun to influence federal actions. In addition, the bonanza days of open-range cattle ranching in the western Arkansas River basin were in full swing. Major Suter had initial charge of this 1879 survey, which covered the reach of the river from Fort Smith, Arkansas, to Wichita, Kansas. It included a resurvey of some of the territory Abert had surveyed in 1869. Handbury assumed this survey from Suter, but the job was completed and the report issued in 1884 under Major Adams.[55]

Adams concluded that the "development of the Arkansas River above Fort Smith would be a useless outlay of much needed funds." The river commerce above Fort Smith "amounts to very little as the reach in question lies almost entirely within the Indian Territory, and the railroads, crossing the river farther up, afford a ready and prompt means of reaching a market for that territory even farther upstream."[56] Railroads had reached the northern fringes of the upstream Arkansas River basin in the mid-1860s.

ILLUSTRATION 41. 1862 Railroad.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR).

By 1870 cattle from Oklahoma, Kansas, Texas, New Mexico, and Colorado were making the "long drive" to Abilene, Kansas. As the railroads pushed westward in the 1870s the shipping points which were the destinations of the cattle drives reached the Arkansas. Dodge City, Kansas, in the late 1870s a cow town as important as Abilene had been, is on the Arkansas and became a railhead for the Atchison, Topeka and Santa Fe. By 1884 much more than just cattle was being carried in and out of the upstream portions of the Arkansas River basin by rail. In comparison, little was being transported by river.

While the survey of the upper Arkansas was under way, Handbury began a consistent lobbying effort to resurvey the busy section of the river below Little Rock; in 1881 Brown's 1833 survey remained the most recent for this highly used reach of the river. Handbury argued, as did his successors, that a permanent improvement program was needed for the Arkansas below Little Rock. He insisted that the only rational way to formulate a lasting or economical program was to initiate a new survey; however, he was not authorized to undertake it.[57]

The third and smallest category of Handbury's projects involved construction. He believed the Pine Bluff revetment and protection project so important that he instituted a project management office there. In constructing Suter's three kinds of erosion protection works, Captain Handbury and his civilian assistant engineer, William H. Bryam, gained experience in working with the latest and most innovative techniques of river improvement being practiced by the Corps of Engineers.

Although Captain Handbury worked on the project diligently throughout his nearly three-year tenure as officer in charge, the construction was not complete when he relinquished responsibility to Major Adams in December 1883.[58] As Handbury explained, neither he nor Suter had been able to get enough done in any one year.[59] The unfinished work was exposed and then damaged by the floods and ice floes of winter. The next spring crews had to repair this damage before making progress. As a result, insufficient time and money prevented completion of this project.

The construction work Handbury superintended on the White River was much less innovative.[60] The workers removed loose rock, blasted the bedrock, and constructed solid stone and brush and stone wing dams at shoals from Jacksonport to fifteen miles beyond Buffalo Shoals. The work employed methods used by the Corps for many years and was not of the same complexity as the Pine Bluff work. In Handbury's opinion these dikes, though successful in deepening the channel, were, like all contraction works, a temporary solution because they could be washed out at any time. Just as on the Arkansas, Handbury urged a complete survey of the White River as the basis for developing a plan for permanent improvements.[61]

At the time of his appointment, Handbury also assumed from Major Benyaurd responsibility for construction on the Black River. This construction was similar, though less extensive, to that on the White. The work on this White River tributary involved building traditional brush and stone wing dams and closure dams.[62] A closure dam is similar to a wing dam, but rather than being constructed in the main channel, forcing the stream to follow a narrower channel, a closure dam is built across the entrance to a side chute or secondary channel. It prevents the water from flowing into these areas, thus assuring adequate depth in the main channel.

The brush and stone dikes Handbury built on the Black River were traditional but effective. Construction began with the building of willow mats formed by joining individually bound clumps

ILLUSTRATION 42. Workers building a willow mat. Willow mats were an essential part of brush and stone dams.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

of willow branches together on one framework. The completed mats were submerged into the river, and rocks were placed on top. This procedure was repeated layer after layer until the desired height was reached. The willow mats followed the contour of the river bottom, while the rocks and mats broke the force of the current.

In 1883 Handbury on his own authority stopped construction of these dikes on the Black River because he did not believe enough money remained in the appropriation for the work to be effective.[63] Work here was not resumed, but in 1882 Handbury began a similar construction project on the Current River, a tributary of the Black.[64] The Current River project was nearly complete when Handbury left the region in 1883 to assume another position for the Corps.

A Real District Emerges

During his seven-month tenure, Handbury's successor, Major Adams, drastically reduced the geographic area under the Little Rock office. His conclusion that the Corps should stop improvement work on the Arkansas River west of Fort Smith reduced the reach of the proto-District by 250 to 300 miles.

Adams also had to deal with some significant engineering problems. Innovative as they were, the structures Suter had designed and Handbury had been building and improving were not effective at Pine Bluff. By 1884 the "erosive action of the river at Pine Bluff had taken in a street which bordered on the downtown area. All the houses along this street were lost to the river. The county courthouse was in very immediate danger of sliding into the river as was the city's commercial district."[65] Major Adams was the officer in charge who submitted a special report to Congress concerning the situation at Pine Bluff.

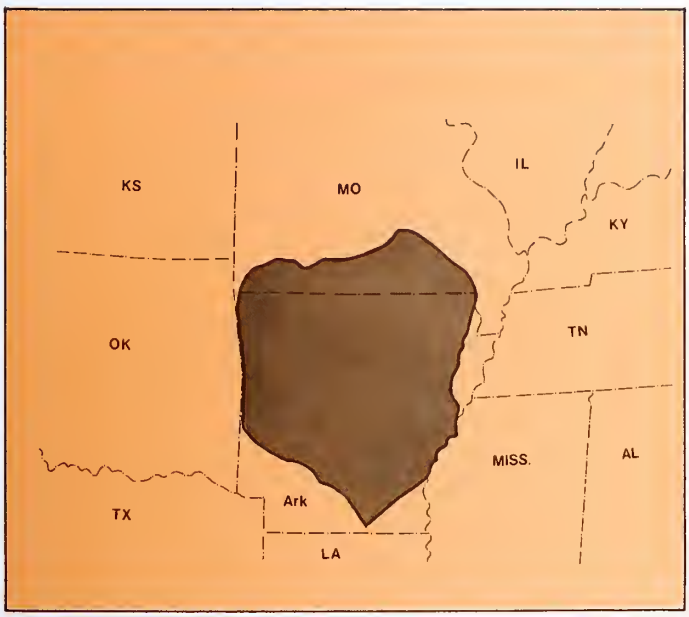


ILLUSTRATION 43. Area which Maj. Adams restricted Corps of Engineers work in 1884.

Because the Pine Bluff project had not succeeded, the civic and commercial leaders suggested rerouting the river's channel. They wanted to aid the river in its efforts to cut through the neck of the peninsula opposite Pine Bluff. Local residents supported this plan although it meant the river and harbor would be some three miles from town.[66] They preferred financial loss rather than lose their town to the river, which they believed would happen unless something was done. Handbury agreed that moving the channel of the river was the best plan since all other efforts had failed to solve the problem.[67] Adams' subsequent report, however, proposed that traditional, solid, impermeable jetties be built along the shore of Pine Bluff to deflect the forces of the river to the opposite bank.[68]

It was not Adams, however, but his successor, Captain Taber, who had to take action. Following Adams' rather than Handbury's recommendations, Taber began construction on a labor-intensive large-scale project soon after he assumed command in July 1884.[69] He paid hired laborers at fifteen cents an hour and worked them ten hours a day.[70] The jetty he built was actually a series of impermeable dikes and permeable hurdles. It formed an S-shaped curve in the channel. By 1887 Captain Taber was able

ILLUSTRATION 44. Capt. Taber's drawing of a detail of the "jetty" he built at Pine Bluff between 1884 and 1887.

Reprint from U.S. Army, Corps of Engineers, ***Annual Report*** *of the Chief of Engineers United States Army to the Secretary of War for the year 1888.*

to report that, although the work at Pine Bluff was incomplete, it "continued at a remarkable pace with progress being very visible. A judicious watch is all that is needed to preserve the town and the navigation of this reach."[71] A sandbar had formed in front of the town, and the bank on the opposite side of the river was beginning to cave. The town assumed new life. The waterworks were now located where the greatest danger had been in 1882 and 1883, and one of the finest hotels in the state lay directly behind the spot where in 1882 and 1884 the river had made a 120-foot inroad.

Taber was not only the officer in charge who finally solved the Pine Bluff problem, but also the officer under whose charge the first Little Rock District really emerged. By the end of his nine and one-half year tenure as officer in charge of the Little Rock office, the District became established as an official administrative unit within the Corps and recognized by the citizenry as an active force in the region and a potential partner in development.[72]

By serving for nearly ten years as a continuous and visible advocate for waterway improvement in Arkansas and Missouri, Taber created in the residents very high expectations concerning what the Corps and waterway improvement could do for them and their area. He also fostered a popular association between himself as a man and the Corps as a local institution. The length and nature of his tenure, much longer than usual, increased his positive influence and his vulnerability.

The normal stabilized tour of duty for military officers assigned to the Corps of Engineers was three years, the same as for officers in all branches of the Army today. By staying more than three times longer than expected, Taber became aware of all of the particular problems of the region and his position. Unfortunately, at the same time he established this unusual continuity at the command level, he developed a somewhat rigid, self-righteous, and arrogant personal style that offended residents of his District.[73]

During the early years of his tenure Taber was committed to improve the Arkansas River even at the expense of improving other rivers in the region, where he argued work was becoming less and less cost effective.[74] He believed these rivers were losing their significance and, while commerce on them was decreasing, the cost of snagging and other improvements was increasing. He confined the District's snagging operations to the Arkansas River as much as possible given the political realities of the period.

In addition to snagging and his work at Pine Bluff, Taber did considerable dike construction work at other places in Arkansas: Fort Smith, Van Buren, Dardanelle, and Little Rock. He also built some revetments. Taber's most significant Arkansas River work was survey and examination work, as had been Handbury's before him. In December 1884, equipped with the quarterboat *Lizette*, plus one yawl, four skiffs, and a flatboat used as a stores boat, ten assistant engineers and thirty-seven men began a new survey of the Arkansas from Little Rock to the Mississippi. Within a month, however, the men lost the flatboat, the yawl, and three of the skiffs in a flood. Virtually recommencing in January 1885, the crew, led by Charles E. Taft, an assistant engineer, completed the field work by April.[75] Based on Taft's 1885 reports and drawings, Captain Taber recommended improving this reach of the river by contraction of the low-water channel through the use of dikes and hurdles.

Taber considered Abert's 1869 survey of the river between Little Rock and Fort Gibson to be quite adequate.[76] But he disagreed with Adams' 1884 conclusions that there was no significant need for navigable commerce in the Indian Territory and that, because railroads effectively served the Arkansas River basin west of that, the expense of waterway improvement there could not be justified.

For the first seven years of his tenure Taber remained firmly convinced that the Arkansas River could compete with the railroads. He saw the Arkansas as "destined to become in the near future a part of a great navigable transportation line to New Orleans, parallel to and competing with the Missouri Pacific system of railroads for the traffic of an immense territory."[77] The Corps was improving navigation between New Orleans and the Gulf of Mexico as well as improving the Mississippi. If the Arkansas River were navigable to Little Rock by boats drawing five feet of water, Taber believed that when the Indian Territory became cultivated, its products would be exported by way of the Arkansas. He also predicted the "well known and fertile state of Kansas" would come to utilize waterways for commercial transportation, and when it did would find Fort Smith or Little Rock its nearest water outlet.[78]

Congress agreed and in 1885 authorized Taber to resurvey the Arkansas' reach between Fort Gibson and Wichita.[79] The field work was completed within a year, and in 1886 Taber submitted his report calling for improvement, albeit only by snagging, of this portion of the river.[80]

A Shift in Emphasis

Unfortunately, despite Taber's optimistic predictions, by 1895 it was well established that one of the essential preconditions necessary for the Arkansas to compete successfully with the railroads could not be met. A navigable depth of five feet could not be attained in the Arkansas River at Little Rock.[81] To prove it, Lieutenant Sibert, then District Engineer, established a 21-mile stretch of river just upstream from Little Rock as a test area. He made elaborate attempts to contain the channel. But a low-water period that followed its construction determined the experiment's results before the regulating devices could prove their worth. In 1897, even with a directed flow, only 1.4 feet of water was present, too little to maintain a navigable channel in the test area or to increase materially the depth of the existing channel. The flood of 1898 caused such damage to the regulating works in the trial reach that the entire experiment failed.

Moreover, by the 1890s commerce in the western Arkansas River basin region had proved, at least in the short run, less than Adams or Taber had anticipated. In addition to the spread of barbed wire fencing, the dry summer in 1886, followed by a bitter winter, proved devastating to open-range cattle ranching.[82] By the spring of 1887, 80 to 90 percent of the cattle on the ranges of Oklahoma, Kansas, Texas, New Mexico, and Colorado were dead. A succession of dry years further shattered the hopes of farmers of the region. The decline of the business cycle in the early 1890s completed the area's economic ruin. The Atchison, Topeka and Santa Fe, paralleling the westernmost reaches of the Arkansas River in Colorado and Kansas, and the railroad completed between Little Rock and Fort Smith in 1884 increasingly underminded the river's commercial importance.

By 1891 even Captain Taber saw that the chances for short-term economic growth were linked to the development of the other rivers of the region. He announced that improvement of the upper White River from Newport, Arkansas, to Forsyth, Missouri, would produce the greatest commercial advantage proportional to cost. He made the controversial suggestion that a system of locks and dams be installed on the upper White River and asked the citizens of the upper White River at Batesville to urge their representatives and senators to secure the necessary appropriations.[83]

Although the Corps and succeeding District Engineers adhered to Taber's position for twenty years, his emphasis on the White River, along with his blatant and inept political behavior, cost Taber his job. Residents of the Arkansas River valley resented the shift of emphasis away from their area, whereas residents of the upper White River expected Taber to produce results regardless of the specific appropriations bills their legislators got passed.[84] It is possible that Taber's ill health contributed to his mishandling of the situation; he died at the age of 45, just four months after leaving the District in the midst of the crisis for six months' sick leave.[85]

Although Taber's political judgments were marred, his engineering ones were not. His successor in late 1893 and 1894, Captain Carl Palfrey, reaffirmed Taber's calls for locks and dams on the White River. Palfrey, transferred to Little Rock from the Mississippi River Commission, also defended Taber's engineering judgments for the Arkansas River.[86] Corps support for Cap-

tain Taber's White River recommendation was reflected in the selection of a new permanent District Engineer to succeed Palfry, the emergency replacement for Taber who served for only about eight months. White River project advocates found an enormously important and effective ally in Lieutenant Sibert, who served as District Engineer from the summer of 1894 until the fall of 1898.

Taber had been a people and idea person. For ten of the eleven years between his graduation from West Point and his assumption of the Little Rock assignment, he commanded the post schools at West Point and spent much of his time on the spiritual welfare of children. Sibert, on the other hand, was primarily a construction-oriented engineer. He was just the man to design and build the locks and dams Taber had recommended. In the ten years between graduating from West Point and assuming command in Little Rock, Sibert directed the remodeling and repairing of the locks and dams on the Green and Barren rivers in Kentucky and contributed to the 20- and 21-foot channels connecting the waters of the Great Lakes. Sibert was probably one of the most illustrious engineers to serve the District.[87]

After completing a thorough survey and examination of the upper White River in August 1894, Lieutenant Sibert recommended that the upper White be developed further by the use of locks and dams.[88] In 1896 Division Engineer Henry M. Robert approved such a proposal for the river between Batesville and Bull Shoals.[89] The system of ten locks and dams designed under Sibert's leadership between 1896 and 1898 involved the latest in lock technology.

Before design began on the White River locks, the Corps had only designed one set of concrete locks, that on the Illinois and Mississippi Canal in Illinois. The Rock Island District had not completed the Illinois and Mississippi Canal locks when work began on the White River plans.[90] Traditionally the massive fixed sides of locks were made with cut stone. The experience gained in building with concrete on the Illinois and Mississippi Canal, the White River locks and dams, and the Moline Lock on the Mississippi River was adapted to subsequent waterway projects, including the construction of the Panama Canal.

The basic structure of the concrete-capped dams Sibert's team designed was formed by large timber cribs. These box-like structures, usually built from pine timbers, were a standard component of impermeable dams, piers, and breakwaters since the early 1800s. Sibert's boxes, built from 16-inch by 16-inch timbers hand-hewn from trees felled near the site, were open on the bottom except for a few cross logs. The interior of each box was divided into compartments by cross pieces. The cribs were built on or near the shore while the river bottom at their planned resting place was leveled by dredges. The cribs were floated in place and sunk by filling them with stone and rock. The weight of the stones resting on the bottom crossbars held them in place. The settling stones kept the cribs from tilting and falling into any open spaces that developed from undercutting. The cribs were not joined together; they were placed close together end to end. The concrete cap poured over the top held them together.[91]

The dams were designed as overflow structures: that is, water was intended to flow over them in all but the driest seasons of the year. During high water, boats were intended to go over the dams and bypass the locks altogether. They had no flood control function by intent.[92] The Corps of Engineers had no authority to build structures for flood control purposes in 1898.[93] The congressional definition of work constituting improvements for navigational purposes had expanded greatly since Captain Handbury opened the first Corps of Engineers office in Little Rock in 1881. Starting with the 1890 annual rivers and harbors act, Congress began omitting the specific proviso that the Corps not build flood control structures.

Sibert's White River dams were extremely well suited as structures designed to aid navigation. They ensured the continuation of open-water navigation on the river for most of the year, and they assured a minimum navigable depth of four feet in a narrow channel even in dry periods. During the last decade of the nineteenth century, the upper White River basin experienced a timber boom with major markets at Batesville and Jacksonport, and mining was increasing.[94] Raftboats, the special steamboats that pushed log rafts down the river, and the groups of ore barges bound to a steam towboat by a complex system of cables and chains needed open-river navigation to operate successfully. Because of their size and construction, it would have been prohibitively expensive for the operators to delay either raftboats or fleets of ore barges long enough to break them into small, 175-foot by 36-foot lockable pieces and then reassemble them every eight miles or so as they traversed the eighty-nine miles downstream from Bull Shoals to Batesville. Both needed as wide an unobstructed area across the channel as possible. The ponderous tows required practically the entire channel width to maneuver in flank-

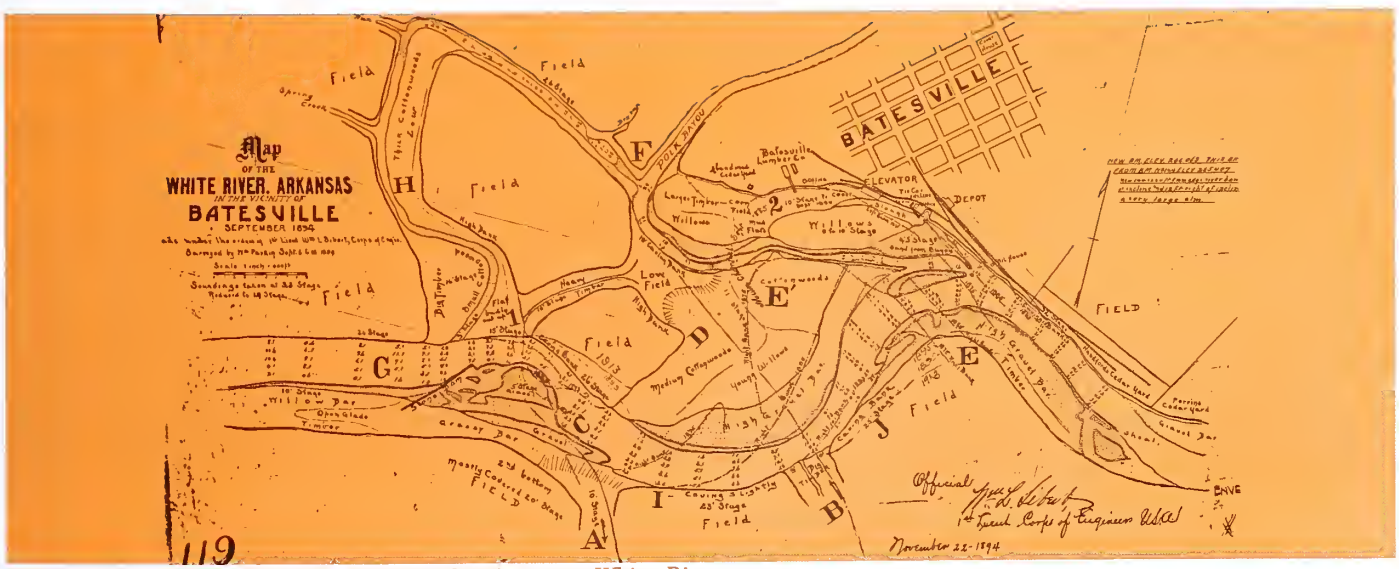


ILLUSTRATION 45. One sheet of Lt. Sibert's upper White River survey maps. (Courtesy of the U.S. Army Engineer District, Little Rock, AR))

ing movements. With overflow dams in place, these movements were possible for most of the year. Only during extreme low water did insufficient water pass over the dams to allow passage of raft boats or fleets of ore barges over the dams.

These locks and dams represented a great change in direction from Captain Handbury's day. In the intervening years the officers in charge of the Little Rock office had to address and make hard decisions on what to do and where to do it. They chose to assist what they saw as the most viable water transport in the region. Emphasis had shifted from contraction works on the Arkansas to locks on the White River.

ILLUSTRATION 46. The White River Locks used the latest technology. They were concrete.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 47. The concrete capped White River dams were designed as overflow structures.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 48. Raft boats needed open water navigation.

(Courtesy of the U.S. Army Engineer District, Rock Island, IL)

Chapter IV

A New Attitude Toward Water Resources, 1898-1921

In 1898 District Engineers had finished all the preliminaries and were waiting for an appropriation to begin work on the White River locks and dams. However, in the same year, a disastrous flood and the Spanish-American War delayed the start of the project a year.

While these events only delayed this project a short while, they presaged national trends that would eventually diminish the District's responsibilities and lead to its closing in 1921. Floods such as the one in 1898, irrigation needs, and demands for hydroelectric power created political pressure for new nonnavigation water resource programs. While the Spanish-American War marked the beginning of overseas involvements that would, in part, mitigate against Corps expansion into domestic nonnavigation waterway improvements. Meanwhile significant waterway transport decreased, diminishing the need for the District's traditional work.

In 1898, however, Lieutenant Sibert and his staff were completing their ambitious plans for lock and dam construction on the White River. When the Spanish-American War erupted in April, Congress authorized the first increase in the size of the Corps of Engineers since the end of the Civil War. Congress expanded the Corps to include 127 officers, of which the largest group, 71 officers, was assigned to the rivers and harbors division.[1]

Then, disaster struck Arkansas. Between 7 and 13 May 1898 one of the largest floods in Arkansas history devastated the District. Whole families were destroyed. Though nearly all streams in Arkansas were affected, the rampaging Arkansas River received the most publicity and, no doubt, did the most damage. At Fort Smith the river rose to 32.1 feet. A quarter of residential Van Buren was under six to ten feet of water. The strength of the current in what is now North Little Rock prevented steamboats from making headway against it. Fifth and Sixth streets in downtown Pine Bluff were also completely underwater, and Captain Taber's "permanent" improvement of the Arkansas River there was washed away.[2] It was apparent that the channel of the Arkansas had to be controlled during high water as well as during low.

This realization fit well with the national mood. For some years an awareness had been growing in the public and their representatives in Congress that America's waterways should be considered as multipurpose resources to be developed not only to aid navigation but also to control floods, store water for crop irrigation, generate hydroelectric power, and provide water for municipal and industrial use. Leaders of the emerging Progressive and Conservation movements promoted this idea.[3]

At the same time people were looking at uses other than navigation, navigation itself faced a crisis. As railroads began to dominate freight transport, more people began fighting vigorously for multipurpose use of the rivers. The 1890s marked the victory of rail over waterborne transportation throughout the country, even in areas west of the Mississippi. By the 1890s confirmed water transport boosters such as Captain Taber were forced to admit that railroad competition had so altered economic conditions that, even in the West, improvement of waterways for navigation no longer produced the greatest economic return. Taber shifted District efforts away from the Arkansas River basin, where railroads offered competition, to the White River basin, where railroads did not yet compete.

Most river improvement supporters did not have the option of shifting emphasis to places where the rails did not go. The primary commitment of navigation improvement advocates was to improve economic conditions locally, not waterways in general. In increasing numbers local and regional water transport boosters supported the multiple-use concept when faced with the changed economic conditions that the railroads created. These supporters thought they could still get the navigation improvements they wanted if they added the benefits to be achieved from compatible second and third uses to cost benefits accruing from improved navigation. A multiple-use improvement would be cost effective where navigation improvement alone would not be. Local residents who did not concern themselves with transport needs because they had other water-related problems nevertheless joined the navigation boosters in promoting multiple-use water resource development. Since aid to navigation was the only legal justification for improving federal waterways, some advocates were willing to have their river improved for navigation to obtain the important side effects of flood control or crop irrigation. This was reflected in the landmark Rivers and Harbors Act of 1899.

This act incorporated a definition of legitimate federally financed water resource development goals. Congress, although still not authorizing the Corps to work actively toward achievement of water resource development goals other than navigation aids, enlarged the Corps of Engineers' role to include regulation

of a wide range of activities on navigable waters.[4] Building on a late 1880s and early 1890s sequence of laws granting the Corps continuing authority to regulate bridges, roads, pipes, and wires crossing navigable waterways as potential hazards to navigation, Congress authorized the Corps to regulate work or placement of structures in navigable waters by making such acts illegal unless the Corps approved them in advance.[5] It is on this basis that the construction of piers, wharves, and docks and activities such as channel excavation and placement of riprap, groins, and mooring devices require Corps of Engineers Section 10 permits today.

However, in perhaps the most significant provision of Section 13 of the 1899 act, Congress authorized the Corps to regulate dumping of pollutants in navigable streams. It can be reasonably argued that when granting this regulatory authority and simultaneously authorizing the Corps to remove sunken vessels and other obstructions including vegetation in lakes and rivers, Congress made the Corps one of the earliest federal environmental protection and conservation organizations in the nation.[6]

In addition to expanding the Corps' role in water resource management nationally, the Rivers and Harbors Act of 1899 also, not incidentally for the Little Rock District, called a halt to all new Arkansas River projects. Meanwhile a special congressionally appointed Board of Engineers surveyed and examined the river and developed a new, more comprehensive plan for its permanent, overall improvement.[7] The act also authorized the Little Rock District to initiate its first lock and dam construction project, the ten upper White River locks and dams designed under Lieutenant Sibert's leadership.

While Congress and the special Board of Engineers considered the overall problem of the Arkansas River, the District repaired the damage done by the flood of 1898.[8] This damage was massive not only because of the magnitude of the flood, but also because of the extent of Corps projects on the river. Even though Captain Taber had shifted emphasis to the White River and Lieutenant Sibert had done the same, the District had not abandoned the Arkansas River. Under Sibert's charge the District had completed significant work at Fort Smith, Van Buren, Dardanelle, Little Rock, and Pine Bluff as well as maintaining work completed under Captain Taber.[9] The District did the most extensive 1899-1900 repair work at Greathouse Bend, six miles upstream from Little Rock, where the 1898 flood had outflanked the existing work and threatened to make a cutoff in back of it.[10] The resulting navigation problem would have been major.

In addition to repair work, the District began land acquisition for the upper White River locks and dams in 1899. Contractors started construction at Lock and Dam Number 1 near Batesville, Arkansas.[11]

Rivals Develop

With the White River project well under way by 1901 it appeared that the fortunes of the Corps and of the Little Rock District were still high. But uncontrollable events with unforeseeable consequences foreshadowed trouble. For example, Congress authorized another increase in the size of the Corps in 1901, the second in four years after a 42-year freeze on military personnel.[12] But the Army assigned even more Corps officers to newly acquired U.S. possessions in the Caribbean and the Pacific, so the stateside rivers and harbors division suffered a net loss.[13] By 1903 only twenty-seven officers were available for duty in fifty-four districts.[14] Even after a 1904 increase, only forty-eight officers were available.[15]

Meanwhile, the Corps' work load kept increasing. In 1907 the Corps assumed construction of the Panama Canal, which it did not complete until 1914. The situation was so dire in 1913 that Isham G. Randolph, former chief engineer for the Chicago Sanitary and Ship Canal, suggested to the National Drainage Congress that civil works projects be taken from the Corps and given to a new government department. Randolph publicly justified his suggestion on the ground that too few Corps officers were available to supervise current flood prevention projects.[16] The Corps' problem of stateside civil works staffing remained acute until the completion in 1915 of a five-year military personnel increase program originally authorized by Congress in 1910.[17]

While the Corps was overextended, Representative Theodore E. Burton, chairman of the House Rivers and Harbors Committee, and President Theodore Roosevelt moved decisively to end the pork-barrel era of the Gilded Age as it affected the Corps of Engineers. In 1902 Congress created a national Board of Engineers for Rivers and Harbors (BERH) within the Corps of Engineers. The BERH reviewed all prospective Corps projects, independent of local political influence, and recommended projects that board members, acting as professional engineers, not administrators, judged meritorious for construction. Although serving to reduce the amount of authority and latitude District Engineers had, this move insulated and protected them from some political pressures. In 1907 this depoliticization process was furthered when the

ILLUSTRATION 49. Little Rock District crew building pile and stone fill dikes to repair 1898 flood damage at Lower Greathouse Bend on the Arkansas River.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 50. Pile and stonefill dike along the Arkansas River near Lower Greathouse Bend on 30 June 1900.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 51. Excavation of White River Lock No. 1 near Batesville in 1900.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 52. Removing spoil from Lock No. 1 pit.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

House Rivers and Harbors Committee adopted a policy of declining to consider for inclusion in annual rivers and harbors bills any project that did not have prior approval of the Corps of Engineers.[18]

In attempting to remove water resource management decisions from the traditional political process, the Corps effectively championed principles espoused by the leaders of the Progressive Conservation movement. The Corps and the leaders of the Progressive Conservation movement argued that decisions about water resource development should be made by technicians, not politicians. Each argued that lobbying, pork-barrel congressional politics, and partisan debate did not lead to rational scientific decision making.[19]

At the same time, public pressure generated by the leaders of the Progressive Conservation movement to manage America's waterways as multiple-use resources began to influence national politics. In 1901 President Roosevelt's administration supported federally constructed engineering works for water storage. A year later Congress passed the Reclamation Act, which provided for federal planning, construction, and development of irrigation works.[20] This significantly increased the types of federal water resource development programs that could legally be pursued. Before 1902 the only legal water resource development goal of any federal agency was aid to navigation, and only the Corps of Engineers could do it; now the Reclamation Service was charged with developing new water resources.

Congress did not include the Reclamation Service in the already overextended Corps of Engineers. The Corps was involved in an effort to limit non-professional control of project selection and was perhaps not seen by Congress as politically responsive to the demands of potential nonnavigation water resource users. The Corps continued its efforts to effect navigation improvements, but with the demands on its personnel, it was unable to expand its role in water resource development. Congress made the Reclamation Service part of the Geological Survey in the Department of the Interior. The Geological Survey had built a staff geared for producing comprehensive, multiple-use plans for development of land and water resources since its creation in 1879.

Almost from its beginning in 1902, the Reclamation Service staff broadened its goal from irrigation as it developed western water resources. As early as 1903 the Reclamation Service began designing and building high dams that stored massive amounts of water and had potential for generating hydroelectric power.[21] In 1906 Congress authorized an increase in the number and type of Reclamation Service functions. The Secretary of the Interior could now sell municipal water supplies and hydroelectric power from the Reclamation Services' irrigation projects. In 1905 Congress also gave the Department of Agriculture's Bureau of Forestry authority to build dams and reservoirs and to plan hydroelectric plants. In 1906 this bureau became the U.S. Forest Service.

By 1906 coordination of the activities of these rapidly proliferating federal water resource development agencies was needed. By the General Dam Act of 1906 Congress required Corps approval of plans for all dams on navigable rivers, regardless of their intended purpose. The Corps reviewed plans for dams on navigable rivers intended to improve navigation, generate power, or store water, and it could require changes in these plans to protect navigation. Thus, navigational goals were coordinated with other water resource development goals.

President Roosevelt tried further to coordinate development of multiple-use projects in 1907 when he appointed an Inland Waterways Commission, charging it to consider all potential waterway uses and coordinate all users' points of view.[22] The commission was to create comprehensive regional, and then national, plans for multipurpose water resource development projects. It recommended that Congress create a single executive agency to develop these plans and coordinate multipurpose water resource administration. Congress feared such planning would reduce legislative influence on selecting projects and give too much power to a permanent executive agency, so it never funded the agency.[23]

Because this effort failed, multiuse advocates perhaps recognized it would be premature to attempt consolidation of water resource development. They began an effort to free the Corps of legal restrictions that limited it to single-purpose projects. Congress had already freed the Reclamation Service from such restrictions, and although the process was long and arduous, Congress made a small first effort toward giving the Corps equal freedom in 1909.

In the rivers and harbors act of that year Congress allowed the Corps to include nonnavigation subordinate elements in proposed navigation projects Congress authorized consideration of coordinating terminal and transfer facilities, water power for commercial and industrial uses, and other waterway-related commercial projects.[24] It wanted the profits from these secondary elements to be applied against the project cost and to partially subsidize navigational improvements.

In the eyes of multipurpose advocates, the most important secondary goal this law allowed was development of hydroelectric power. Unfortunately, the Corps could not in good professional conscience pursue the goal of hydroelectric power generation as

part of navigation projects. The Corps believed the best techniques for improving rivers for navigational purposes were not compatible with the best techniques for generating hydroelectric power. The only form of navigation improvement that could be potentially compatible with hydroelectric power generation was upstream reservoirs.

However, from the 1850s through the 1870s the Corps argued consistently that creation of artificial reservoirs to provide adequate depth for navigation was not a realistic way to improve navigation.[25] Then, during the height of the Gilded Age, it built just such reservoirs at the headwaters of the Mississippi as aids to navigation.[26] These reservoirs did not prove the issue one way or the other, and controversy has surrounded them since the 1880s. By 1909, partially because of this controversy and fundamental professional questions surrounding the effectiveness of Mississippi headwater reservoirs, the Corps was once more firmly committed to not using reservoirs to improve navigation. Simultaneously, the Corps accepted the commonly held idea that the only cost-effective techniques for generating hydroelectric power required high-dam reservoirs. Given these positions, the Corps could not develop plans incorporating both navigation and power generation.

Therefore, the Corps' early twentieth-century emphasis to depoliticize its decision-making process and to do what its staff thought was professionally best, regardless of what politicians wanted, exacerbated Corps difficulties. It did not matter whether the Corps was aware that single-purpose navigation projects frequently could not be justified in traditional cost-benefit analysis terms. The Corps apparently could not advocate simultaneous improvement of a waterway for navigation and development of cost-effective hydroelectric generating facilities without sacrificing the progress it had made toward professionalizing itself.

Because of this view the Corps was unable, until the advent of World War I, to find an isolated project where it could reconcile simultaneously generating hydroelectric power and improving navigation. The Corps began constructing Wilson Dam in 1918 to harness Muscle Shoals on the Tennessee River to produce power for munitions manufacture. Much like the Keokuk Lock and Dam complex on the Mississippi River built by private enterprise under Corps supervision between 1905 and 1914, Wilson Dam created a large, deep slack-water navigation pool upstream from the dam. The Corps did not complete the Wilson Dam project until 1925.[27]

By the time Wilson Dam was begun, the Corps was constructing projects in certain carefully circumscribed areas of the country with primary purposes other than navigation improvement. The Corps intended these projects for flood control.[28] Congress only allowed the Corps to build these projects in the Mississippi River valley from the Head of the Passes to Rock Island, Illinois; in the delta basins of water courses connected with the Mississippi; along the Ohio River from its mouth to the mouth of the Cache River; and along the Sacramento River in California. The Flood Control Act of 1917, which authorized the Corps for the first time to build projects intended for flood control, mandated that it consider the improvement's probable effects on navigability. Thus the Corps had to choose a flood control method that did not conflict with navigational improvement theory.

Luckily, combining flood control and navigation did not present the problem that simultaneously improving a river for navigation and generation of hydroelectric power did. The Corps was still committed, as it had been for nearly sixty years, to the confinement theory of flood control.[29] Since the famous Humphreys-Abbot report of 1861, the Corps had consistently rejected building artificial reservoirs on tributary streams to control flooding and endorsed the use of levees along banks of main streams as the only realistic means of flood control. The Corps consistently considered this method under its 1917 charge to develop flood control recommendations. Such flood control measures fit well with the Corps' early twentieth-century navigational improvement theory. The Corps was as firmly against reservoirs for navigational improvement as it was opposed to reservoirs for flood control. The Corps could, therefore, plan for dual use—navigation aids and flood control.

The Flood Control Act of 1917 did not, however, stop with the requirement that the Corps consider the probable effect of its flood control actions on navigability of a particular waterway. It permitted the Corps to consider subordinate elements that served goals other than flood control or navigation improvement. Like the 1909 Rivers and Harbors Act, the 1917 Flood Control Act authorized the Corps to consider possible economic development and utilization of water power and other commercial projects.

Unfortunately, for the same reasons the Corps had not been able to take advantage of the similar opening offered it in navigation projects since 1909, it could not simultaneously pursue flood control, improvement for navigation, and power generation. The theories were incompatible. The Corps' approach to aiding navigation and controlling floods generally led it to find that the simultaneous generation of hydroelectric power at most locations was not feasible.

Consequently, the Reclamation Service, with its projects that simultaneously stored water to irrigate crops, generated hydroelectric power, and provided water for municipal and industrial use, continued to eclipse the Corps in the estimation of the people who supported comprehensive, regional, multipurpose water resource development. Neither a statutory obligation to improve navigation/nor a statutory restriction to refrain from interfering with it hindered the Reclamation Service. There was no incompatibility among the engineering approaches to its tasks.

Perhaps because of the differing images supporters of multipurpose water resource management had of the two agencies, in 1917 Congress authorized the Waterways Commission to assume the mission proposed for President Roosevelt's never-funded executive branch Inland Waterways Agency. Congress intended that the 1917 Waterways Commission coordinate work of the several federal departments and commissions concerned with waterway resource development. It wanted its Waterways Commission to ensure federal agency cooperation in producing a comprehensive plan for development of the nation's waterways and water resources for "purposes of navigation and every other purpose."[30] Unfortunately, American entry into the war in Europe prevented the commission from undertaking its charge.

During World War I, with more urgent matters to consider, Congress did not pursue the goals of federal waterway improvement. After the war, however, the issue reemerged as a focus of debate, although it unfortunately became entangled in the question of whether the Corps' civil works function should be transferred to the Department of the Interior or a new, cabinet-level, national public works department. Corps opponents pointed out that the Department of the Interior's Reclamation Service projects generally served at least three water resource development purposes simultaneously while Corps projects generally served only two. Not all supporters of multiple-use water resource development compared the two organizations in this way. Those who did generally ignored or dismissed as irrelevant or erroneous the fact that differing project objectives dictated differing project methods. Thus they also failed to see that differing engineering theories supported different methods.

The engineering theories of how best to store water for irrigation, for municipal or industrial use, and for hydroelectric power generation did not, and do not, conflict or contradict each other. Reclamation Service reservoirs generally served these three purposes simultaneously. Adding hydroelectric power generation to water storage simply means more water must be stored. Thus, the designers increased the difference between the level of water to be stored behind the dam and the level of water flowing downstream of the dam. It made no difference whether the Reclamation Service or the Corps built the dams. If the projects were simultaneously to serve these specific multiple purposes, either agency could have constructed them without a theoretical problem.

Conditions Deteriorate

The District was having local problems as well. After a series of short-term District Engineers, a captain, Graham D. Fitch, assumed command of the Little Rock District in April 1901. During his five-year tenure he restored some continuity at the command level. The District completed a survey for Lock and Dam Number 3 on the upper White River in 1901, proceeded with work on Lock and Dam Number 1, and began construction on Lock and Dam Number 2.[31] The specially appointed Board of Engineers studying the Arkansas River also submitted its report in 1901. Board members recommended to Congress a $25 million plan of improvement which called for a navigable channel from the Grand River to the Mississippi. Official boundaries of the Little Rock District were changed to reflect this decision not to improve the river between what is now Muskogee, Oklahoma, and Wichita, Kansas.

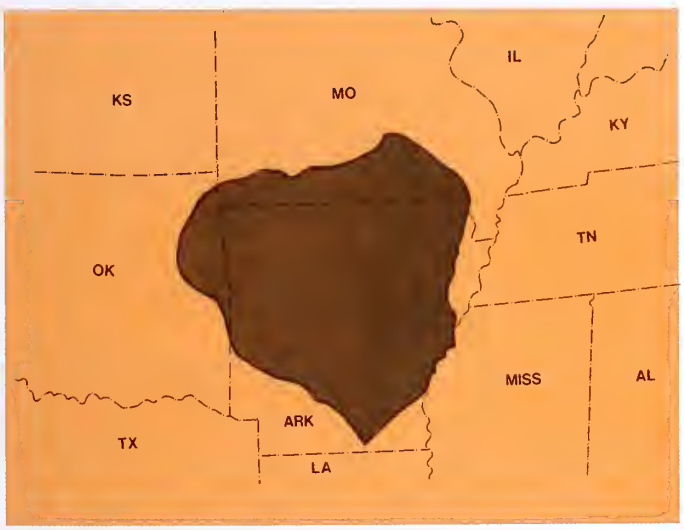


ILLUSTRATION 53. Official boundaries as reduced in 1901.

Aside from this 250- to 300-mile reduction in the reach of the District, the Board of Engineers report led to little action. The Corps attempted no new Arkansas River work. Major Graham D. Fitch recommended none, pending congressional action on the Board of Engineers report. The District waited to begin permanent river improvement on the length of the Arkansas from the Grand River to the Mississippi; it waited from 1902 to 1904, but Congress never acted on the board's 1901 recommendation.[32]

Meanwhile, conditions on the Arkansas River deteriorated. The disastrous drought of 1901 and early 1902 affected Arkansas severely. Abnormal weather reduced the normally shallow and meandering river to a "muddy and sand clogged stream."[33] The drop in depth exposed numerous snags and sandbars and reduced the channel to depths too shallow for navigation. The drought financially ruined many in the District, placed whole communities under the care of charitable organizations, and had a considerable effect on commerce.[34] As late as December 1903 the *Arkansas Gazette* reported three boys wading across the river below Little Rock through water that did not reach their knees. An attache of the U.S. Engineer's office in Little Rock doubted the story, but did admit that the river could be forded in a buggy.[35]

Events soon turned. The flood of 1903 arrived, and in 1904 the normally heavy silt load carried by the river increased. The masters of boats tied them up at the levee because of the "thickness" of the water. Observers estimated the water to be about one-third mud, making it impossible for boats to work their engines or boilers. The sediment caused the water to "foam" when pumped into the steamboat boilers, clogging the gauges needed to regulate them.[36] Then the exceptionally cold winter of 1904-1905 completely halted river traffic. For the first time in several years the Arkansas River froze over.[37]

A subsequent respite from flood or drought ended in 1908 when the Arkansas seethed again. In late November heavy rains fell in Oklahoma and elsewhere in the upper Arkansas valley. These rains rapidly brought the Arkansas to flood stage at a time when the Mississippi was at a low stage. The Arkansas River's quick rise threatened property on the outside of its bends. By 2 December 1908 "the rolling, boiling, unmanageable stream had been threatening to devour the very heart of the Pine Bluff business district, including the Jefferson County Court House."[38] The Hotel Jefferson; Berlin Brothers' big sales and livery stables; and two blocks of businesses, one on either side of the courthouse, were in immediate danger of falling into the river.[39]

The Corps had been busy at Pine Bluff in the years between 1898 and 1908. Captain Taber's "permanent" improvements at Pine Bluff had been washed away in the flood of 1898. Almost as soon as the waters receded, the Little Rock District began building new revetments and levees to protect banks upstream of the town and in front of the city from eroding again. The new upstream revetments and levees were successful almost from the start. They kept the river from cutting across the point of land opposite the city, which would have left Pine Bluff high and dry, miles from the waterfront, but they also kept the water flowing directly against the bank in front of the town.

The new dikes and revetments intended to keep the bank from eroding immediately in front of Pine Bluff did not work as well. Before the flood started, in November 1908 the river had completely destroyed all the District's structures that protected the Arkansas' bank from Chestnut to Tennessee streets. The two

ILLUSTRATION 54. Erosion at Pine Bluff.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

blocks of riverfront bounded by Front Street (which no longer exists) on the north and by Pullen Street on the south between Chestnut and Tennessee caved into the river, taking with them a number of residences and businesses.[40] On 28 November, still before the flood reached Pine Bluff, a heavy rain fell on the city. Within hours more river bank began sliding into the apparently calm river.[41]

Then the Pine Bluff *Daily Graphic* announced that a major, rapidly rising flood was on its way downriver toward the town.[42] Near panic ensued. Hundreds of men made large crib fascines of willow and cottonwood saplings and tied them along the water's edge. Fascines were groups of wooden cribs or forms filled with saplings. The men bound individual cribs together with rope or wire, and then fastened the groups of cribs to the bank with cables or, where possible, sunk them and secured them with rocks.[43]

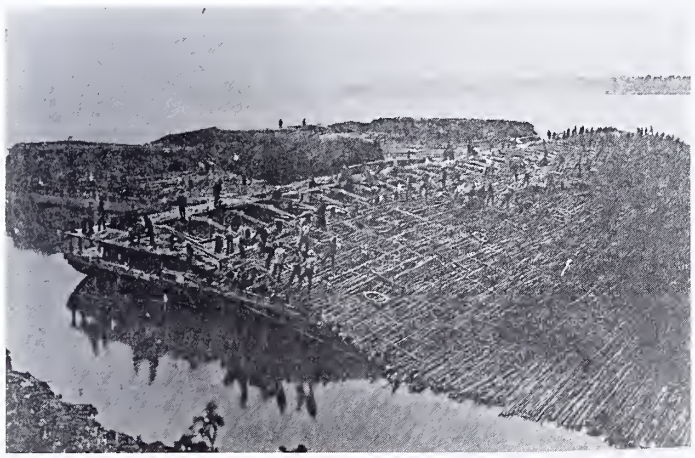


ILLUSTRATION 55. A fascine under construction. (Courtesy of the U.S. Army Engineer District, Memphis, TN)

On 30 November even more bank caved, and Pine Bluff business leaders and property owners held two mass meetings at the courthouse. In a move reminiscent of the petitions of 1884, at the morning meeting some citizens proposed cutting a canal through the neck of land just north of Pine Bluff, thus permitting the Arkansas River to change course. Such a move would cut off the city from the waterfront; it would cause the river to strike the south bank two miles below the city. This would however, save buildings of Pine Bluff's business district from falling into the river. Some property owners suggested that the best location for this canal would be through the levee at Vaugine Neck. This levee, recently completed by the Little Rock District, protected the west side of the 250-foot-wide neck of land opposite the town from erosion. The levee was located about one mile north of the Pine Bluff riverfront. The Little Rock District's purpose in building the levee was to keep the river near the town.[44]

Owners of property situated east of the business district opposed the plan to cut a canal through the levee. Officials of the Cotton Belt railroad, which had its car and repair shops and its roundhouse and other property on a large tract of land in the eastern part of the city, were particularly outspoken in their protests. Plantation owners east of the city flocked into town and threatened a court injunction to stop construction of any canal. Because the circuit judge and chancellor were out of town, it was impossible for opponents to obtain the injunction.[45]

A committee, appointed at the first meeting, visited the north bank of the river and reported on it at the afternoon meeting. They recommended that the canal be cut and that the government be asked for permission to cut the levee.[46] Consequently, the "committee of safety" appointed at the meeting sent a plea to the War Department in Washington, D.C., requesting permission for local citizens to cut the government levee. The next day, 1 December, Brigadier General William L. Marshall, Chief of Engineers, replied that he did not have the authority to grant permission. So the secretary of the Pine Bluff Board of Trade, the mayor, and a county judge sent a telegram to President Roosevelt urging him to intercede with the Secretary of War to have the necessary authority given to the Chief of Engineers.[47]

Also on the morning of 1 December, a part of the frame Knox and Bluthenthal warehouse at West Pullen and Chestnut streets slid into the river. The caving near the courthouse was more noticeable than the previous day. William Parkin of the Little Rock District headquarters office wrote a letter to Mayor W.L. Tooney of Pine Bluff advising him that the staff of District headquarters in Little Rock had heard that some local citizens intended to dynamite or cut the government levee. Parkin warned the mayor that this action should not be taken. Parkin stated that the course of the Arkansas River was not to be changed in any way.[48] That afternoon U.S. Senator James P. Clarke arrived to examine the situation so that he might seek some relief from the federal government.[49] At a mass meeting that evening, a unanimous vote supported a declaration that the people of Pine Bluff wanted the levee at Vaugine Neck cut and the Arkansas River made to flow away from the city. Senator Clarke agreed to go to Washington and personally take the matter up with the Secretary of War.[50]

Between 30 November and 2 December, 100 feet of bank between Chestnut and State streets had fallen into the river, taking with it the Berlin Brothers' livery stable, a large brick structure on the east side of Court House Square, and more of the Knox and Bluthenthal warehouse. By the afternoon of 2 December the water was three feet from the courthouse, endangering the $200,000 annex to the structure which the county had constructed only two years before. The presiding county judge ordered the building abandoned and stripped. A crew of mostly volunteers began removing everything, including the hardwood doors, plate-glass windows, steam heaters, and marble wainscoting. That same afternoon the principal of Branch Normal (now the University of Arkansas at Pine Bluff) and thirty-two students from the college marched as a group to the riverfront and offered their services in the fight to save as much of the town as possible. They worked steadily building fascines until late night.[51]

While they were working a gigantic explosion shook Pine Bluff. Many residents thought that one of the big buildings in danger on the riverfront had caved into the river. Not so. Matt McGehee, Abb S. Knox, an individual named Smith, and three assistants had dynamited the levee at Vaugine Neck. By the next morning the current along the south bank of the Arkansas River between Chestnut and State streets had slackened. The river spared the courthouse and the Hotel Jefferson. Instead, the force of the river became focused on the bank downstream. It began to cave the bank behind the American Excelsior laundry on the northeast corner of East Barraque and State streets about 200 yards from the courthouse. The owners were able to remove the laundry equipment before the rear of the building collapsed into the river. The caving of the bank between East Pullen and Barraque streets also drove residents of Pine Bluff's "tenderloin" district from their elegant apartments and houses. The *Daily Graphic* recounted the losses of "the ladies of the night" in each fresh addition.[52]

The next morning, Captain G.R. Lukesh and William Parkin arrived in Pine Bluff to face citizens indignant over the receipt of a message sent from the War Department on 1 December. In this letter General Marshall claimed he knew nothing of condi-

tions in Pine Bluff and thus could take no action to give the people of Pine Bluff permission to cut the government levee. The local citizenry believed this was untrue. They argued that they had provided information in their communication of 30 November and would have been glad to provide any further information needed.[53] Regardless of the citizens' feelings, Captain Lukesh reported that dynamiting the Vaugine Neck levee had accomplished its purpose and saved much of the town. He reported, however, that in his opinion the courthouse had been so weakened that even though it had not fallen into the river it should be demolished.[54]

Despite the success of the blowout, the Little Rock District proceeded to repair and re-create the levee as the Boyd Point levee.[55] The Corps of Engineers was not the only organization building structures on or near the Arkansas River in the early years of the twentieth century, for the annual reports of the Little Rock District Engineers for these years contain frequent reports of newly constructed bridges across the river. The piers of these bridges were themselves a hazard to navigation; but, in addition, on the silt-ridden Arkansas they fostered new sandbars. The bridge piers acted like permeable dikebuilders, slowing the river's flow so that sediment could be deposited and accumulate behind them. The newly created sandbars posed a greater hazard to navigation than the bridge piers themselves.

These impediments were just one factor contributing to the decline in riverboat transportation. Each year there was less Arkansas River traffic than the year preceding. By 1910 one of the traditionally most profitable steamboats, offering daily service between Little Rock and Memphis, abandoned service.[56] Most people considered the St. Louis, Iron Mountain and Southern Railroad (now the Union Pacific) service between the two cities to be more desirable despite its higher freight charges. As river traffic decreased, the Corps of Engineers undertook less and less improvement work on the river. As the Corps did less, navigation conditions became worse. As conditions worsened, fewer boats used the river. Thus the Corps found it harder to justify spending money for waterway improvements. Each new ''cost-benefit analysis'' led the Corps to a firmer commitment that the existing river traffic did not contribute enough to the economic welfare of the region or the nation to merit a federal expenditure to assist it.

The Corps' position put pressure on local residents, economic boosters, and individuals who earned their living from river traffic. Representatives of various cities along the Arkansas met and discussed the problem and considered tactics that might lead to restoration of government support to the river economy. Representatives from Little Rock, Fort Smith, Pine Bluff, Dardanelle, and Indian Territory towns formed the Arkansas River Improvement Association in the early 1900s. This group staged media events, such as a 1906 boat trip from Muskogee, in what is now Oklahoma, to Fort Smith. The river boosters organized the trip to publicize the fact that navigation was still possible and feasible on that reach of the Arkansas River.[57] They also lobbied Congress and pressured their locally elected officials. Many a man's election to Congress hinged on his attitude toward federal river improvement.

By 1906 many river proponents had come to believe that Major Fitch, the Little Rock District Engineer, was part of the problem because he did not recommend massive permanent improvements to the Arkansas River.[58] Fitch defended himself by pointing out that the massive expenditures required were not justified and that Congress would not appropriate the funds because river-based commerce did not support the expense. Despite these protestations, the Arkansas congressional delegation made an effort to remove Fitch from office. Major General Alexander McKenzie, Chief of Engineers at the time, publicly refused the delegation's direct request to have Major Fitch transferred or recalled, defending Fitch by saying he was adhering to Corps policy and doing his job. However, within a few days of the delegation's meeting with the Chief, the Corps announced that Major Fitch had completed his normal tour of duty and would be transferred to a new position on Lake Superior in Minnesota.[59]

Captain William D. Connor, Fitch's replacement, could change neither the course of events nor Corps policy. Connor could spend less time than Fitch working on Arkansas River issues. The shortage of Corps officers available for stateside rivers and harbors work was acute. Connor was the first of a series of five District Engineers between 1906 and 1915 who served concurrently as Little Rock and Memphis District Engineers. Congress authorized no new Corps work on the Arkansas River; District activity on the river diminished as river traffic declined. In his 1908 annual report, issued just before the Corps reassigned him, Connor announced that, after spending $1,237,901.07 for construction and maintenance in disconnected reaches of the river, the Corps was abandoning its effort to improve the Arkansas.[60]

Captain Connor and his successors followed and expanded on Major Fitch's lead on the White River. No railroads paralleled the upper White River when Congress authorized and the Corps designed the locks and dams system; the river was the only outlet for commerce. However, traffic peaked on the upper White River in 1900, the timber boom leveled off, and the railroads crept upstream. As early as 1903, Fitch publicly noted in his annual report that, although the upper White River locks and dams project was sound from an engineering perspective, it was no longer warranted in terms of the commerce supported by the river.[61] He recommended that the federal government cease making large expenditures in the region in light of their economic return. In his opinion the railroad could do the necessary job more cheaply and quickly. Once the St. Louis, Iron Mountain and Southern Railroad extended its tracks from Batesville upriver this was undeniable.[62] However, Congress did not agree with Fitch's recommendations to cease work and continued to fund the project.

The Little Rock District placed Lock and Dam Number 1 in operation in October 1903 and completed it on 16 January 1904.[63] Lock and Dam Number 2 began operation on 16 February 1905 and Number 3 on 1 February 1908.[64] Because the Corps controlled how money was spent on the project, it funneled all appropriations to these parts of the project and started no work on the other seven locks and dams. In 1911, after a study by a board of engineers, the Corps of Engineers announced its decision to cease further construction on the upper White River lock and dam system.[65] This event occurred during the period between Major Meriwether Lewis Walker's departure as commander of the Memphis and Little Rock districts and Major Clark Stull Smith's assumption of the dual command. The District, however, continued to operate the three completed locks and dams until 1952 when it sealed the locks but left the dams in place.

With construction work on the Arkansas and White rivers abandoned, the operations and maintenance mission of the Little Rock District became paramount. By 1911 Congress seemed to agree with the Corps that the decline of river traffic in the District was so great that economic benefits to be gained by aiding it were too few to justify the costs. As interest in navigation declined, interest in flood control increased.

The great flood of 1912 focused national attention on the issue of flood control after it inundated the Mississippi and Ohio

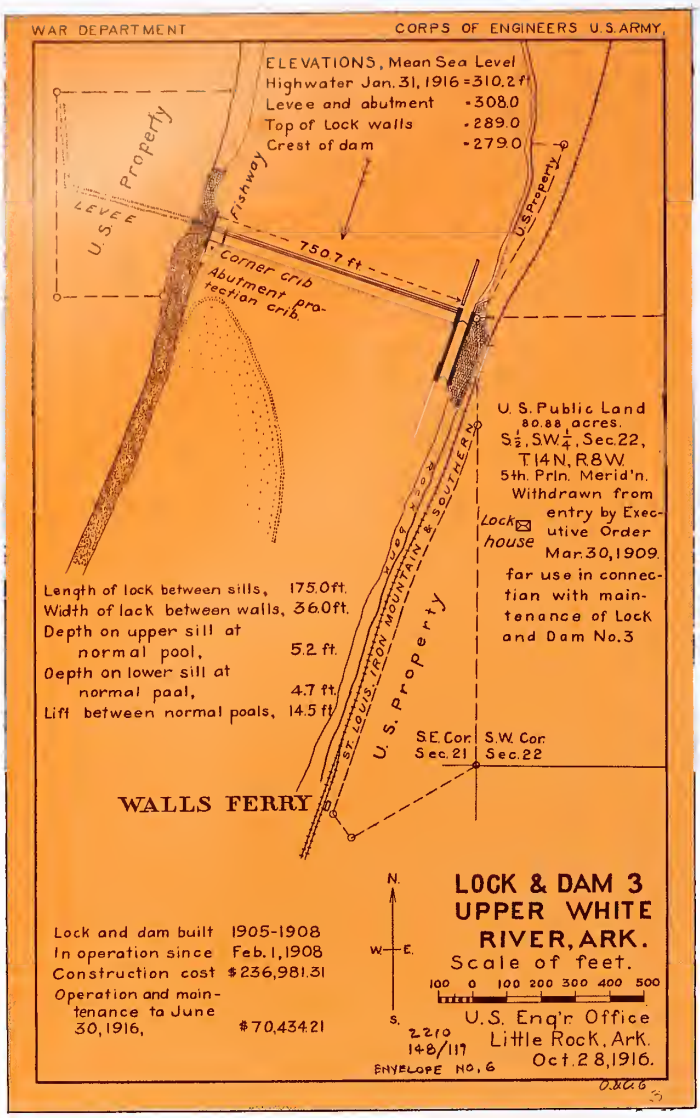


ILLUSTRATION 56.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

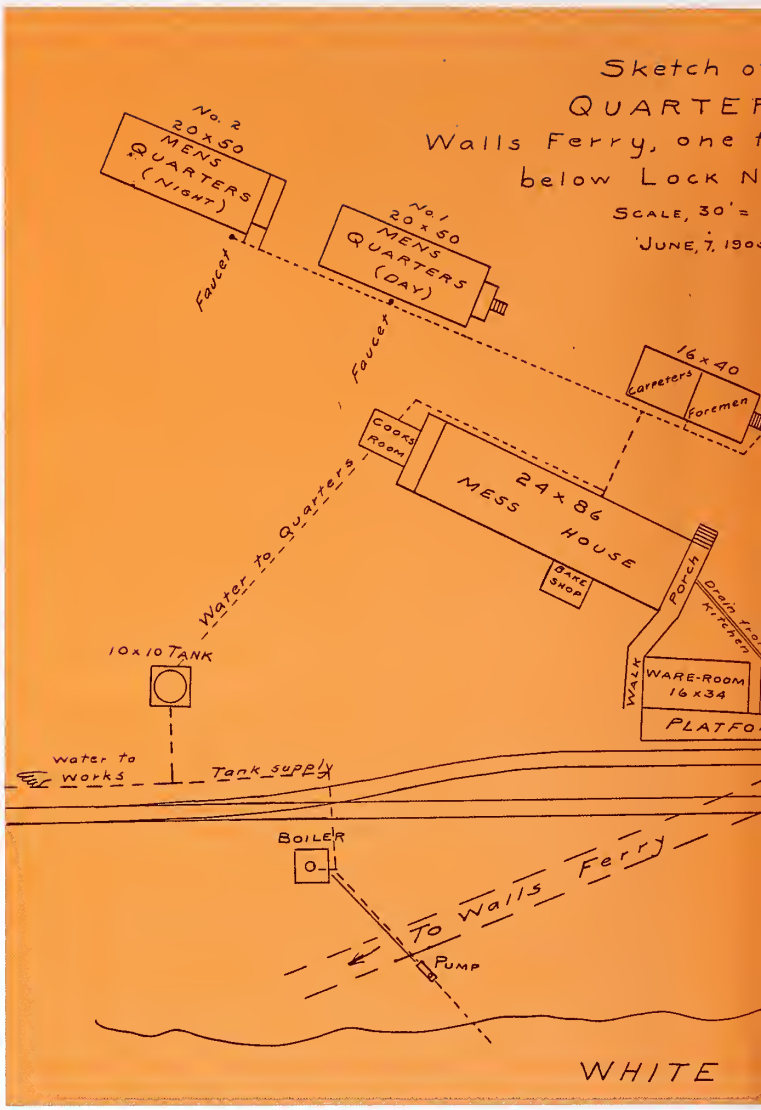


ILLUSTRATION 57.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

valleys, as well as the eastern portion of the Little Rock District. For the first time local officials sought and obtained federal aid.[66] President William Howard Taft assigned some Engineer officers to strengthening levees and others to transporting food and tents to flood victims. He used his emergency fund to provide more national aid and personally visited the ravaged area. Another national flood in 1913, only slightly less serious than the one in 1912, confirmed the need for federal legislation.

Proponents of improved navigation on Little Rock District rivers sought to use the interest in flood control generated by these two disasters to revive interest in their goals, as did their counterparts throughout the country.[67] Congress authorized some new navigation improvement work for the White River at DeValls Bluff, while it authorized surveys and examinations of limited reaches of the St. Francis, L'Anguille, Current, and Arkansas rivers. The Arkansas River boosters' efforts were more effective in 1911 than in 1906 not only because of the national mood but also because Oklahoma had received statehood in the interval. Business interests in Oklahoma were eager to develop industrially, and navigation held great promise for furthering this goal. Before 1907 the commercial impetus for improving the Arkansas River had come mainly from Little Rock and was, comparatively speaking, somewhat limited.

The 1914 outbreak of war in Europe dashed any hopes of quick congressional action. Demands of the war and the ensuing struggle between the Corps of Engineers and the Quartermaster Corps mitigated against congressional authorizations and appropriations to allow the Corps officially to begin either flood control or navigation improvement. The roots of this struggle lay in the development of the art of war.

As the twentieth century began, the enormous increase in construction needs of the Army caused by rapid, mass mobilization and systematic training involved in technologically modern war demonstrated that military construction was the key to military preparedness.[68] The Corps of Engineers and the Construction Division (the renamed and expanded Cantonment Division) in the Quartermaster Corps were the two main military construction agencies. Even before America's entry into World War I, a struggle commenced between these two agencies for control of military construction. During World War I and for most of the interwar years, the Quartermaster Corps retained responsi-

bility for behind-the-lines construction; its Construction Division built stateside camps and cantonments, ports of embarkation, training centers, posts, stations, airfields, schools, hospitals, bases and depots, and munition plants and depots. Congress limited the Corps of Engineers' military construction function to building actual fortifications, none of which were needed in twentieth-century Arkansas and southern Missouri.

Meanwhile, in 1916 another major flood occurred on the Mississippi as flood waters were draining from the Arkansas River. The damage was immense and Congress intervened. With the Rivers and Harbors Act of 27 July 1916, Congress authorized the Corps of Engineers to reexamine the upper White River while considering how to provide year-round navigation with additional locks and dams.[69] In March 1917 Major Elliot J. Dent, Little Rock District Engineer, issued his examination and survey report, which concluded that further improvement of the upper White River was unjustified. Almost immediately after Major Dent issued his report, the Corps transferred him from the District after a seventeen-month tour of duty. Lieutenant Colonel George P. Howell temporarily succeeded Dent as District Engineer; after eight months he too was transferred. In 1917 command of the District fell to Phillip R. Van Frank, the only civilian ever to command the unit. Presumably the Corps appointed a civilian District Engineer because its relatively few military officers had war-related tasks or higher level civil works commands.

Within days of his appointment Van Frank was pointing out to local residents how few boats were using the upper White River locks and dams.[70] According to Van Frank only two boats in the previous two years had benefited from the locks and dams. By the end of November Van Frank had officially proposed to the Chief of Engineers that Locks and Dams Numbers 1, 2, and 3 be abandoned and removed from the river, explaining that this course of action had been considered since 1915. The Chief did not, however, convey Van Frank's recommendation to Congress. The issue remained unresolved until 1929 when Senator Thaddeus H. Caraway of Arkansas introduced a bill calling for removal of the locks and dams from the White River.[71] By then the District opposed such action, saying that destruction of the present navigable capacity of the stream by removing the dams for the benefit of a few riparian owners was not justified. Congress agreed with the Corps, and the bill was defeated.

The Flood Control Act of 1917, which authorized the Corps' first official flood control work in the Mississippi and Sacramento river valleys, called for a complete resurvey of the Arkansas River. The act brought the Arkansas and White rivers, as tributaries of the Mississippi, under the jurisdiction of the Mississippi River Commission.[72] Little happened immediately, however, as a result of this legislation. Five weeks after passage of the act Congress declared war on the Imperial German Government. The District restricted work to operations and maintenance for the duration of the war.

The Corps as a whole concentrated its primary attention on its combat mission. In light of the military work, Congress increased the Corps as soon as the war began. Naturally the Corps assigned most of these men to military rather than civil duty.[73] Before the Armistice concluded the war, the Army had sent 296,000 American Engineer troops into the combat zone and Army Engineers had erected hundreds of bridges; repaired and constructed roads, railroads, airfields, and port and harbor facilities; and built hospitals, depots, and cantonments.

At the end of the war the question arose, what federal agencies should supervise both military and civil construction? The compromise reached in 1920 relieved the Corps of Engineers of all military construction responsibilities except for construction of actual fortifications; however, the Corps maintained its wartime staff size and its prewar role in civil works construction. It continued to serve as the primary federal agency responsible for waterway improvement projects intended to benefit navigation. It remained one of several federal agencies authorized to consider flood control and hydroelectric generation in waterway improvement plans.

Despite the importance of the Corps' civil works functions in this period, in 1921 only 69 of its 505 officers were supervising domestic public works.[74] Most of its officers, just as most other Army officers, were training members of the new civilian components of the Army created by the National Defense Act of 4 June 1920. Most Corps officers trained members of the civilian National Guard and the civilian Organized Reserves (Officers and Enlisted Reserve Corps).

After the war the Little Rock District undertook two surveys of the Arkansas River.[75] It completed the first survey, of the river from Little Rock to its mouth, in December 1920. It completed the second, including the reach of the Arkansas River between the Grand River in Oklahoma and Little Rock, in January 1921. Later that year the Chief of Engineers announced that, aside from

occasional snagging on reaches actually used for navigation, federal improvement of the Arkansas River was not advisable.

In light of these decisions, on 27 April 1921 Corps headquarters discontinued the Little Rock District and moved its functions to Memphis. Presumably, this saved the Corps money and allowed it to consolidate functions. This would have freed personnel slots for use elsewhere in the organization. The change had little local effect. The Corps continued to focus on operations and maintenance functions within what had been the Little Rock District.

The former District was not unique in this regard. All Corps of Engineers civil works units in the 1920s were primarily performing maintenance, not new construction. The fortunes of the Corps were at a low ebb during the interwar years.[76] The Corps found that, having become less responsive to political pressure, it was more vulnerable to challenges by groups and organizations that did not need to prove their professionalism; hence it continued to be responsive to political interests. By 1921 the private, civilian engineering industry had matured. It began lobbying against the continued retention of engineering responsibilities by the Corps of Engineers and the Quartermaster Corps. The non-military federal engineers in the Department of the Interior's Reclamation Service and the Department of Agriculture's Forest Service supported these moves. During the early 1920s Herbert Hoover, a civilian professional engineer, led the drive for a civilian engineer-dominated national public works department. Throughout the 1920s and into the 1930s, this drive put the Corps of Engineers in danger of losing its civil works functions to either the Department of the Interior or a new, cabinet-level, national public works department and of losing its military construction functions to the Quartermaster Corps or to a new, separate construction branch of the military.

The closing of the Little Rock District in 1921 must be seen as a part of the overall reduction of activity and retrenchment occurring in the Corps in the face of threats to discontinue its nationwide rivers and harbors operation. While other agencies' utilization of waterway resources turned more and more to serve nonnavigational purposes, navigation remained the Corps' primary civil work mission, and the Corps continued steadfastly to believe that navigation was incompatible with most other forms of improvement. This belief, coupled with the major decline of river traffic in the Little Rock District, made the work load insufficient for the Corps to maintain separate offices in Little Rock and Memphis. For sixteen years the District would be merged until a new philosophy in the Corps led the Chief of Engineers to reactivate the Little Rock District.

ILLUSTRATION 58. The steel hulled snag boat, the **Arkansas**, *seen here along the Little Rock waterfront, was one of the District's prime maintenance tools in the 1920s.*

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Chapter V

Origins of the Reactivated District, 1921-1937

After the Corps deactivated the District office and transferred its functions to the Memphis headquarters in 1921, waterway improvements did not stop but continued at a low level for the next sixteen years. During that period Congress changed the constraints within which the Corps carried out its waterway improvement mission. By freeing the Corps from the requirement that it improve the navigability of all the waterways it worked on, Congress allowed the Corps to embrace multi-purpose planning as the basis for developing river basins. The Flood Control Act of 1936 recognized flood control as the federal government's responsibility and designated the Corps as the agency with primary responsibility for federal flood control. The act authorized several projects in the Arkansas River basin, leading the Corps to reactivate the Little Rock District and create a new Southwestern Division to handle the work load.

Congress Begins Changing the Constraints

In 1925 Congress took the first steps toward changing the constraints within which it asked the Corps to work. The Rivers and Harbors Act of 1925 did not free the Corps totally from the requirement that most Corps waterway projects be primarily for navigation, but the act deemphasized that requirement. With this act Congress ordered the Corps and the Federal Power Commission (FPC) jointly to develop a list of all navigable rivers and streams (except the Colorado River) where power development appeared practical. The selection criterion of hydropower potential rather than navigation constituted a significant shift in emphasis. Once the Corps and FPC developed the list, the act ordered them jointly to submit to Congress cost estimates for examinations, surveys, or other appropriate investigations of these waterways. These studies were to include general plans for the most effective navigation improvement, taking into account waterpower potential, flood control, and irrigation.[1] This was in keeping with the congressional policy of the preceding seven or eight years in successive flood control and rivers and harbors acts.

Congress identified creation of this list and development of cost estimates for waterway studies as first steps in a process to develop comprehensive plans for multi-purpose water resource development. The act required that the Corps explore the feasibility of integrating individual river-by-river multipurpose plans into basinwide plans. The Corps was to integrate the basinwide plans into comprehensive regional plans, and then regional plans into a national plan.

In spring 1926 the Corps and the FPC submitted to Congress a list of about two hundred navigable river basins where hydroelectric power appeared feasible and practical. They also detailed the examinations, surveys, and other investigations necessary to develop plans of action. The goal was to improve navigability in conjunction with the most efficient compatible development of the waterway's potential for waterpower, flood control, and irrigation. The plans also had to work within the framework of the comprehensive basinwide, regional, and national plans. Finally, the joint submission included cost estimates for the studies. The government printed the submission as House Document No. 308 on 12 April 1926.[2]

On 21 January 1927, in its rivers and harbors acts, Congress authorized the Corps to conduct the studies recommended in this document and appropriated funds for the Corps to develop a unified multipurpose plan for each of the two hundred river basins.[3] Only in 1927 was the work that President Theodore Roosevelt envisioned for his 1907 Inland Waterways Commission and that Congress had planned for its 1917 Waterways Commission undertaken. That Congress gave the Corps this pivotal role strengthened it in its battle for survival as a federal civil works agency. Although the Corps was to consider all the uses for the waterways and to coordinate points of view of all potential users of the water, it was not authorized to approach the task objectively. The statute still forced the Corps to give priority to navigation interests.

The Flood of 1927

Soon, however, a series of events occurred that eventually led Congress to authorize the Corps to weigh more equitably all points of view. This action was pivotal to and symbolized by the reactivated Little Rock District. Before this happened, however, nature focused the attention of Congress, the Corps, and the nation on the problems of high water. By 21 January 1927 when Congress passed the Rivers and Harbors Act, four days of unusually heavy and constant rain began swelling rivers of the entire Mississippi River drainage basin. By April enough rain had fallen over the 1,240,000 square miles the Mississippi and its tributaries drain in thirty-one states and two Canadian provinces that, had the water been spread evenly, it would have been nearly a foot deep

throughout this vast area. Even after evaporation and absorption, more than sixty cubic miles of the rain that fell that spring still had to reach the Gulf of Mexico. Parts of seven states, including about half of Arkansas, were inundated by what was then called the "greatest natural disaster ever to befall the United States."[4]

In April and May the flood was at its worst. All Arkansas rivers overran their banks, and small streams became rivers. The Arkansas River was a raging torrent at Little Rock. Railroad employees placed fourteen cars full of coal on the Missouri Pacific Lines' steel Baring Cross bridge to weight it down. Despite this effort the swirling current began to vibrate the bridge, and on 19 April train and bridge plunged into the flood. Three feet of water stood in the North Little Rock business district that day. At Pine Bluff water reportedly marooned five hundred people on a bridge northeast of the city. One woman gave birth while stranded there. The rest of the group supposedly kept their spirits up by singing hymns, including "Shall We Gather at the River."[5]

The White River was also on the rampage. Water stood in buildings as far north as Newark, Arkansas. Officials shut down Newark's light plant for several days until workers could build a sandbag dike around the engine and generator and pump the water out. The levee held at Newport, but the river reached a stage two feet higher than previously known. The levee at Clarendon broke and flood waters totally inundated the town. Even after the water receded observers reported the stench in Clarendon was unbearable. Mud and slime filled the streets. Relief workers brought in lime by railroad carloads to use as a disinfectant.[6]

The countryside nearest the Mississippi fared the worst. Because of backwater and Mississippi levee breaks, virtual inland seas covered much of the flat eastern lowlands of Arkansas. One experienced captain reportedly sailed his three-hundred-ton steamboat out of the channel and became lost in a flooded forest. On 15 April a major break occurred in the levee at Whitehall. The crevice grew to 1,250 feet long. Water flooded eighty thousand acres and left eighty-five hundred people homeless. Farther south the government had to evacuate Marianna totally. Steady rain soaked the unfinished Knowlton levee. Water finally broke through and flooded one hundred thousand acres, caused nineteen deaths, and forced thousands to find temporary shelters. At Arkansas City the levee held, but it broke upstream at Pendelton. As a result, water poured into Arkansas City from the town side of the levee. Within two hours of the Pendelton break, mules were reportedly drowning in Arkansas City's main streets faster than they could be unhooked from wagons. Before day's end six feet of water surrounded stores and homes. At one point water was ten feet deep in town, four feet higher than on the river side of the levee.[7]

The 1927 flood's importance to the area now in the Little Rock District was immense. It flooded millions of acres, forced hundreds of thousands to flee their homes, and claimed the lives of nearly a hundred people and over twety-five thousand animals. Property damage alone resulting from Arkansas River overflow and breaches in the Arkansas River levee system exceeded $46 million.[8]

Donald H. Connolly, District Engineer for the Memphis District, committed all his men and equipment to fighting the flood. But the disaster was so severe that Connolly and his personnel could not hope to win the battle. They, like the rest of the organizations and individuals trying to deal with the disaster, soon switched the focus of their efforts from flood control to rescue and relief. Memphis became the center of a relief effort unlike any ever seen in the history of the United States.[9]

To alleviate human suffering and devastation in Missouri, Arkansas, Mississippi, Illinois, Kentucky, Tennessee, and Louisiana, state and federal governments, the American Red Cross, and other organizations joined in a single coordinated relief expedition. The federal government organized and coordinated this expedition. President Calvin Coolidge sent Secretary of Commerce Herbert Hoover to establish the federal Flood Relief Headquarters at Memphis. Chief of Engineers Major General Edgar Jadwin established temporary headquarters in Memphis to work with Hoover. Organizers used the Corps of Engineers in every way possible to minimize suffering. Hoover organized a flotilla of forty steamboats to rescue people and animals and established small tent towns on high ground. Workers distributed quinine and other medicines in these camps to fight epidemics of mumps, measles, and whooping cough that spread among the survivors and to prevent epidemics of typhoid and malaria that health officials feared would erupt. Meanwhile relief workers provided daily requirements such as balanced meals for residents of the camps.[10]

As the extent of the tragedy became increasingly apparent, demands escalated for a meaningful answer to the question, What can be done to keep this from ever happening again? Just continuing to build levees was obviously not doing the job. Levees alone were inadequate, as the flood of 1927 had shown; no matter how well the engineers conceived, designed, and implemented a levee system, that alone could not control the volume of water from a flood of this size.

The Mississippi River Commission and the Corps of Engineers both submitted reports to Congress on ways to prevent future disasters like the 1927 flood. The plan contained in the Corps of Engineers' report dated 1 December 1927 (known as the Jadwin Plan) promised to provide similar flood control protection to that detailed in the Mississippi River Commission's special report dated 28 November 1927, but at less than half the cost of the commission's plan. Congress adopted the Jadwin Plan, with some conditions.[11]

The Jadwin Plan proposed that a comprehensive flood control program for the Mississippi River drainage basin should be directed toward handling two separate situations. Corps theorists argued that most floods occurring within this drainage area would be less severe than the flood of 1927. Therefore, most flood control works constructed should be for less exceptional situations. However, the Corps pointed out that even greater floods than the one in 1927 could strike the Mississippi River basin, so General Jadwin's staff, establishing a precedent-setting procedure, identified the worst storms on record for the Mississippi drainage area. They built a theoretical worst-case scenario of the 1927 storm that produced the worst possible runoff. The Corps then predicted that the worst flood that would occur at the Arkansas River would be 11 percent greater than the flood of 1927. The Jadwin Plan included provisions its designers saw as adequate for dealing with such a hypothetical flood.[12]

Under the Jadwin Plan, stabilized and improved banks and channels together with, strengthened and extended levees averaging twenty-five feet high would increase the flood-carrying capacity of the Mississippi and its tributaries, allowing them to carry routine, or "probable," floodwaters. The plan provided for protection of banks from caving to prevent meandering and changes of course and insured stability of the main channel with the use of revetments, contraction works, and dredging. The Jadwin Plan further established new standards for levees, standards based on a determined amount of freeboard above the maximum probable flood. By these standards some levees would be forty feet high.[13]

ILLUSTRATION 59. East Sixth Street in Little Rock during the flood of 1927.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 60. Flood of 1927.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 61. Main Street of Gillett, Arkansas, on 27 April 1927.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

However, as the Corps finally admitted, implementation of these traditional stabilization and improvement measures and construction of such levees increased the amount of water in the river, reducing the amount of extra water that could be carried before it would flow over or through banks or levees. Before contraction works or levees were constructed, in times of high water rivers extended into side shoots, spread out at relatively shallow depths over a wide area of river bottom, or overtopped their banks. The extra water flowed into adjacent low ground, into the river's natural overflow areas, or flood plain, which served as temporary sumps or storage areas for flood waters. These storage areas protected downstream land from flooding or at least reduced the magnitude of a downstream flood if one occurred. Each side shoot that was cut off, each area of channel that was narrowed to increase its depth, and each levee that was built closed off another natural outlet and forced an artificially increased amount of water downstream. This reduced the amount of additional water the stream could accommodate before it flooded, unless downstream levees were made higher and stronger. The Jadwin Plan proposed to avoid embarking on a program of building endlessly higher and stronger levees by creating artificial outlets to replace natural ones that the stabilization and improvement process and the levee system had eliminated. These outlets or pressure vents would allow the river to overflow into selected parts of the former flood plain; they would relieve the main channel of enough water to lower the flood to a stage that the levees could handle. In effect, they would make exceptional floods routine floods.[14]

The Jadwin Plan called for construction of four artificial outlets, a mix of floodways and spillways. The northernmost outlet was the New Madrid floodway which, when a fuseplug levee was blown, would allow the river to vent excess flood waters onto Missouri land where the Corps had purchased flowage rights. The Corps would thus release excess water before the waters of the Ohio joined those of the Mississippi, increasing the depth of the main channel until the downstream levees would be ineffective. The second and third outlets, at Old River and Morganza in Louisiana, would divert about half the Mississippi's floodwaters down the Atchafalaya River and into the Gulf of Mexico. The fourth outlet was the Bonnet Carre Spillway built to release floodwaters in a controlled way into Lake Pontchartrain before they reached New Orleans.[15]

Other Provisions of the Flood Control Act of 1928

The Flood Control Act of 1928 by which Congress adopted the Jadwin Plan, contained three other momentous provisions. First, the act ordered the Mississippi River Commission to effect the plan "under the direction of the Secretary of War and supervision of the Chief of Engineers."[16] Prior to this, the Mississippi River Commission had, in effect, supervised the Corps of Engineers in the vast Mississippi River drainage basin. Since its establishment in 1879 the commission had been concerned with navigation and flood control on the Mississippi River. In 1882 Congress authorized it to repair and build levees only if that work was part of a plan to improve navigation. Congress expressly prohibited the commission from repairing or building levees for flood control. Not coincidentally, with that same rivers and harbors act, Congress relieved the Mississippi River Commission of the responsibility of implementing its own plans; it authorized the Secretary of War to implement commission plans under the commission's direction and supervision.[17] The secretary delegated actual work to the Corps of Engineers, making the Corps work for the commission. For example, the Corps did the flood control work that Congress authorized it to perform in the Mississippi River valley in 1917 "in accordance with the plans, specifications, and recommendations of the Mississippi River Commission."[18] By reversing this traditional situation and giving the Corps new power relative to the Mississippi River Commission, the Flood Control Act of 1928 strengthened the Corps vis-a-vis its other rivals in federal water resource development.

The act made another dramatic change by modifying the way flood control was financed. Before 1928 Congress upheld the principle that local contribution to the cost of flood control was a prerequisite of federal involvement in the work. This act stated that "no local contribution to the project herein adopted is required."[19] By eliminating the local financial stake, Congress gave local governments less say in how a project was undertaken.

Finally, in a move that would be even more important for the future reactivated Little Rock District, Congress ordered that the Corps develop plans for controlling floods on all Mississippi River tributaries. The act specifically identified the Arkansas and White rivers and their tributaries as areas for which flood control plans should be developed. General Jadwin had already established a special Reservoir Board of Engineer officers who had examined the subject. They determined the Jadwin Plan to be "far cheaper than any method the board has been able to devise for accomplishing the same result by any combination of reservoirs."[20] Despite this action, the Flood Control Act of 1928 stipulated that the studies undertaken to formulate new flood control plans for the Mississippi's tributaries must explicitly consider controlling flood waters by establishing reservoirs. Moreover, the act ordered that the comprehensive basin studies itemized in House Document No. 308 should also explicitly consider what effect flood control reservoirs in the drainage basins of the Mississippi's tributaries would have on further controlling floods in the lower Mississippi valley.[21]

In May 1928 Congress could still expand the scope of the studies called for in House Document No. 308, later known as the 308 Reports. Congress authorized the Corps to conduct these studies in January 1927. The Memphis District had little time to work on these reports because of the 1927 flood and preparation of the Jadwin Plan. The Corps only really began substantial work on the studies needed during the late spring of 1928 because field crews did not work during high water.[22]

308 Studies in the Area

The survey and examination crews working in what is now the Little Rock District faced many problems. In the northern and western part of the region they had to deal with mountainous and upland terrain in the Ozarks and Ouachitas. In the late 1920s primitive roads compounded problems presented by the terrain. Trucks could only take the crews so far; the crews then had to plow ahead on foot. In one case, Joe Stiles, an instrument man on the crew surveying the Cache River for the 308 Reports, recalled the crew reaching the river and realizing it had to get to the other side to do its work. Even though the river was seventy-five feet across at this point, Stiles lashed his tripod, other gear, and clothes to a log. Other party members lashed their gear and clothes to the same log. All began to swim across the river, pushing the log ahead. Stiles had unscrewed his transit and was carrying it high in one hand, while pushing the log with the other and kicking furiously. Halfway across, it seemed everyone was kicking against one another. It was only after Stiles told the men to release the log and swim ahead that one of them explained that he could not because he did not know how to swim. So, as Stiles reported, the party continued across the river with him pushing, dog-paddling, and holding the transit, while the others just hung on.[23]

Even when there were roads, government trucks were frequently mired in mud and crews had to rely on local farmers to extricate them. Government licenses on the crews' vehicles made getting help difficult. Until the crews established that they were not interested in interfering with local farmers' "personal business," they were more likely to be met by a shotgun than with a helping hand. Del Schmand, another member of an early survey and examination crew, recalled one of his men being captured, stripped, and nearly hung before his captors decided to take him back to the crew's camp to let him prove he was really a member of the Corps group. Crew members working along the Black and White rivers claimed they encountered a still about every five miles. Once they distinguished themselves from revenuers, they would often be invited to sample the stock. For the crew to have refused would have led to renewed suspicion that they were revenuers as well as being generally impolite.[24]

Nearly every crewman from this era had a story to tell about the high jinks and elaborate pranks they played in the towns through which they passed. When crew members established that they were not revenue agents, but rather a hard-drinking, hard-playing bunch who looked, talked, and dressed like the local farmers, they had far fewer problems. Most crewmen commented on how accommodating the locals were after these facts had been established, although occasional trouble persisted. Some farmers, particularly those in southern Missouri who had good, black bottomland, were afraid that the presence of a crew in their area meant the government was going to take their land. "Shorty" Baird, one-time head of a survey party working on the Black River, recalled starting across a man's farm but, seeing a crew working in a field, going over to explain that his men were just running a line of level, not driving stakes. Baird then asked if it was all right if one of his men went across the man's field. The farmer replied, "It's all right if he starts, but he'll never come out alive on the other side."Baird called off the work.[25]

The survey and examination crews working in the flat eastern lowlands of Arkansas and in the Arkansas River valley had their problems too. The meandering Arkansas River in the delta, particularly in the reach of the river south of Pine Bluff, presented crews with some of the most difficult land surveying problems imaginable. In some places south of Pine Bluff the river meandered as much as twenty-five miles and wiped out all the General Land Office corners and built up tremendous accretions of land in some locations. These accretions changed land contours, and the new contours were again changed almost overnight by floods and shifts in the channel. In one 308 study, survey crews had to map an area three times because it changed so much while they were recording it.[26]

Early Cultural Heritage Preservation Efforts

While the 308 crews were in the field, other Memphis District personnel were also completing another, much less time-consuming task involved in creating comprehensive river basin plans for the District. In 1906 Congress passed and President Theodore Roosevelt signed America's first heritage legislation: the Antiquities Act of 1906.[27] This act provided for protection of all antiquities and monuments on federal lands and made federal agencies accountable for any potential impact their actions might have on archaeological, cultural, and historic resources. In keeping with this recognition of the importance of the nation's heritage, President Calvin Coolidge signed an act in 1926 authorizing the Secretary of War to submit a plan to Congress for commemoration of domestic battlefields. The act prohibited federal acquisition of property containing a domestic battlefield until the War Department reported on the significance of the battlefield.[28]

To develop comprehensive river basin plans the Corps needed to clear the way for federal land acquisition should it be necessary and to learn what restrictions would be imposed on its activities arising from domestic battlefields in the basins. As early as 1925 the Army War College decreed that domestic battlefields fell into three categories: those deserving of commemoration by being designated national parks, those deserving the battle lines of the forces engaged being indicated with a series of markers, and those deserving some form of monument.[29] Each form of commemoration would have a different impact on comprehensive flood control for a river basin.

In the same report, the Army War College recommended that the Pea Ridge battlefield in the White River basin be commemorated by some form of monument. By the War Department appropriations bill of 23 February 1927, Congress appropriated $15,000 for further study, survey, and field investigation of domestic battlefields.[30]

In spring 1928 the Chief of Engineers' Office ordered the Memphis District to prepare a report on what was known about the site and its current commemoration and to develop a cost estimate to conduct a further study of the Pea Ridge battlefield. The 15 May 1928 report that P.R. Van Frank, former Little Rock

ILLUSTRATION 62. Survey crew at work.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

District Engineer, prepared clearly constitutes an early cultural heritage preservation effort by the Corps of Engineers in the area.[31] Thus the Corps has been involved in historic preservation in Arkansas for over sixty years.

The Corps Changes Its Philosophy

In November 1928, Herbert Hoover was elected President of the United States. Hoover was a professional civil engineer and, as head of the 1927 flood relief expedition, had first-hand experience with inadequacies of traditional stabilization and improvement programs and levee systems. He was an adamant supporter of upstream reservoirs on tributary streams to control floods on major rivers.[32] Chief of Engineers Jadwin was as firmly opposed to flood control reservoirs as the new President was in favor of them. Jadwin also adamantly opposed most other river improvements that Hoover favored. For example, Hoover supported a nine-foot-deep navigation channel project for the Mississippi River.[33] Hoover and Jadwin recognized that the best way to accomplish flood control on the upper Mississippi was through a slack-water navigation system of locks and dams. However, Jadwin opposed placing even low dams across the Mississippi, just as had the Rock Island District Engineer who headed the study team.[34]

Almost as soon as his administration assumed power, Hoover replaced General Jadwin as Chief of Engineers with Major General Lytle Brown, who served from 1929 until the inauguration of President Franklin D. Roosevelt and the appointment of a new Chief in 1933. Brown shared Hoover's opinion that upstream reservoirs could be used effectively for flood control. Under Brown, the careers of lower ranking Corps officers who advocated building dams flourished. General Brown required that officers opposed to reservoirs as flood control devices consider the idea, and many changed their minds. By the time President Roosevelt relieved General Brown of his command, reservoirs had almost come to be considered an orthodox method of flood control.[35]

During Brown's tenure as Chief of Engineers, Congress authorized construction of and the Corps began work on the locks and dams for the Mississippi River nine-foot-deep channel project.[36] The Corps also completed planning for the construction of Fort Peck Dam on the main stem of the Missouri River. The Corps initially intended that the resulting reservoir would improve navigation by providing water to the lower reaches of the river during dry seasons.[37] The Corps used this same strategy in the nineteenth-century reservoirs it built at the headwaters of the Mississippi River.

Factors entirely beyond his control furthered General Brown's efforts to modify engineering opinions held by many on his staff. Between 1907 to 1929 the American trucking industry became a viable competitor to rail lines and waterways. Great long-haul trucking companies appeared immediately after World War I. This new industry, offering ready and prompt delivery of products to markets and raw materials to manufacturing sites, began to attract traffic from the railroads and waterways. Rivermen and railroad men were hard pressed by the altered economic conditions created by the rise of the trucking industry. The Corps found it increasingly difficult to justify projects that exclusively benefited navigation. More than ever a project needed multiple benefits to justify its cost.[38]

Discovering significant flood control aspects of projects became increasingly popular during the Great Depression. As the Depression deepened, concern grew among politicians and the general populace that it was not only appropriate but also necessary that the federal government try to reduce the suffering of the populace. Because floods cause human suffering and are tangible occurrences, unlike economic cycles, something should be able to be done to control them. As politicians became more frustrated in their efforts to relieve human suffering caused by intangible factors, they became more insistent on doing something to relieve the effects of floods and other tangible forces. Many politicians came to accept the premise that reservoirs were essential to relieve human suffering and to protect human life, regardless of their cost. Corps officers had, during the past decade, learned the cost associated with being less politically responsive than rival organizations. They began to react to these political interests. The Corps reversed itself on a number of projects it had formerly judged too adverse to navigation. Revised reports concluded that suffering caused by recurring floods negated a project's detrimental impact on navigation.[39]

Similarly, public works that once seemed uneconomical began to have appeal for providing employment. As early as March 1931, a year and a half before the New Deal, Congress authorized Secretary of War Patrick J. Hurley to spend more than $52 million on river improvement projects that were justified as unemployment relief work.[40] In March 1932 President Hoover personally appealed to Congress to pass a bill appropriating $60 million for rivers and harbors projects intended to ameliorate unemployment. As this process of congressional involvement continued, the Corps under General Brown's leadership reconsidered both the value of upstream dams and reservoirs and the non-navigation aspects of multipurpose projects. In both reassessments the Corps reversed itself on projects formerly judged not cost effective. Revised reports concluded that the necessity for public relief work provided justification for construction.[41]

It took time for these factors and General Brown's leadership to transform Corps philosophy. The transformation was incomplete when studies on river basins in the Arkansas-southern Missouri area were finished. The Corps completed its study of the applicability of flood control reservoirs for the Arkansas River basin on 10 July 1930, only a year and a half after Brown's appointment and less than a year into the depression. It submitted its 308 Report on the White River basin to Congress nine months later, on 30 April 1931.[42] Both reports disapproved of reservoirs as aids to flood control.[43] The Corps completed its report on the Arkansas River and tributaries from Hutchinson, Kansas, to the mouth of the Walnut River on 28 January 1932 and its report on the remainder of the Arkansas River and tributaries on 10 June 1932. It submitted its Black River basin 308 Report to Congress on 1 March 1932. Although General Brown's philosophy influenced these reports, they do not reflect as fundamental a change in Corps-wide philosophy as did reports produced after 1933.[44]

General Brown's influence was not limited to flood control. When Herbert Hoover became President in 1928, there was new impetus for the creation of a new, civilian-engineer-dominated, national public works department. To alleviate the breach with the private sector engineering community, General Brown announced in 1929 that further Corps of Engineers rivers and harbors work would be done by contract except where it was manifestly impracticable or a waste of government funds. Following this action private engineering groups eased their new public pressure to remove military engineering responsibilities from the Corps of Engineers and the Quartermaster Corps. Active lobbying to consolidate federal civil works engineering in the Department of the Interior continued. In a final presidential effort in January 1933, Hoover issued an executive order transferring civil works functions of the Corps to the Department of the

Interior. Congress saved the Corps' civil functions by disapproving this order.

The pressure to transfer the Corps' civil works to the Interior Department continued under President Franklin Roosevelt. Secretary of the Interior Harold L. Ickes wanted Interior's Bureau of Reclamation to assume the Corps' civil works.[45] Roosevelt was at least initially receptive to this idea, as reflected in his November 1933 recommendation that money be allocated for either the Department of the Interior's Reclamation Service or the War Department's Army Corps of Engineers survey of the Arkansas River basin.[46] The President obviously saw either organization as being capable and appropriate to do the work.

Local Improvement Advocates Begin To Support Upstream Reservoirs

The flood of 1927 also promoted other events. Many private citizens who later assumed key roles in securing federal participation in development of the Arkansas and White rivers traced their personal interest and involvement in the project to the flood of 1927. The group included "Newt" Graham of Tulsa, Clarence Byrnes of Fort Smith, Reece Caudle of Russellville, Arthur V. Ormond of Morrilton, Jack Murray of Little Rock, Emmett Sanders of Pine Bluff, and John P. Morrow, Sr., of Batesville.[47] As early as 1928 groups of local residents in the Arkansas and White river basins called for a series of flood control dams at the foot of the Ozarks.[48] In criticizing the Jadwin Plan, these private citizens spoke for many other residents in the Mississippi River drainage basin. By 1931 the private Mississippi River Flood Control Association proposed an alternative to the Jadwin Plan featuring reservoirs on the principal tributary streams of the river.[49]

The efforts of these river improvement advocates came to fruition in 1933 when new projects were considered. An example is when the Corps considered a Little Rock to DeValls Bluff canal connecting the Arkansas and White rivers.[50] Construction of such a navigation canal would have cut off from Corps navigation assistance all areas along the Arkansas River below Little Rock. Traffic to or from these destinations would neither have been on the main line nor have had direct access to it. Consequently, groups from that area, such as the Pine Bluff Chamber of Commerce, helped defeat the proposal. Groups from areas farther south and east defeated a substitute proposal calling for a canal from below Pine Bluff to the White River. A continually eastward-moving opposition to the idea of a navigation canal existed throughout the 1930s.[51] Although at the time this discussion appeared fruitless, in historical perspective it was not. These discussions worked through a series of issues that had to be resolved before a final route for an Arkansas River improvement channel could be settled. They resulted in the eventual location of the Arkansas Post Canal connecting the Arkansas River and the White River in the 1960s.

In 1933 federal action in another river basin led to increased lobbying for the river improvements in the Arkansas and White river basin areas. The Wilson Dam project, managed by the Corps between 1918 and 1925, provided the germinal idea that, after 15 years of controversy, matured as the Tennessee Valley Authority (TVA).[52] President Roosevelt explained to Congress in requesting passage of the legislation that the TVA was, from its inception, intended to serve as a model for use in other areas of the country.[53] The concept for this project went beyond multipurpose river development into the total resource and economic development of an entire region of the country. Congress charged the government corporation created by the TVA act "with the duty of constantly studying the whole situation presented by the Tennessee River Valley, and adjoining territory, with the view of encouraging and guiding in the orderly and balanced development of the diverse and rich resources of that section."[54] The TVA's specific sixfold goals were to ensure the maximum amount of flood control, the maximum development for navigation purposes, the maximum generation of electric power consistent with the above, the proper use of marginal lands, the proper methods of reforestation, and the economic and social well-being of people living in the river basin.[55]

According to John P. Morrow, Jr., the Arkansas River drainage basin had had the first opportunity to be the site for this "grand social experiment."[56] Before he announced his initiative in February 1933, Franklin Roosevelt reportedly asked Arkansas Senator Joseph T. Robinson about creating an Arkansas River Valley Authority, and Robinson refused him.[57] If true, Robinson certainly changed his mind. By November 1934 he, with Representatives David D. Terry and John E. Miller, led a drive to create an Arkansas River Valley Authority "while the government is still actively engaged in providing funds for such developments."[58] This initiative may have been motivated by the Arkansas congressional delegation's awareness that the Public Works Administration (PWA) planned no major Arkansas River works.

President Roosevelt announced in January 1934 that all PWA waterways projects were to be done in accord with comprehensive regional plans produced in the 308 process.[59] The Mississippi River Commission reviewed the 308 Reports for that river's drainage and identified possible PWA projects in accord with those plans. In December 1934 the commission publicly announced that the PWA should perform no projects to improve the Arkansas River or its tributaries for either navigation or power generation.[60] Simultaneously, a special committee investigating possibilities of development of the Mississippi River found the Arkansas and White rivers "offered pioneering opportunities hard to find in any other part of the U.S."[61]

No one reconciled differences between these reports before another disastrous flood occurred in the region. Under pressure of a three-day rain in northern and western Arkansas, the Arkansas River began to rise ominously in March 1935. Before the emergency subsided all streams and most rivers in the area overtopped their banks. The White, Black, Current, Little Red, and Fourche LaFave joined the Arkansas in a rampage reminiscent of 1927. Although never equalling the 1927 flood, the 1935 flood spread over much of the same area. It affected large portions of the lower Mississippi River drainage basin. By 19 March, in thirteen counties of Arkansas and Missouri alone, it had forced 15,030 people from their homes, washed out railroad bridges, knocked down telephone lines, and caused extensive property damage throughout the region. The water raged twelve feet above the Forsyth, Missouri, dam on the White River. Flood waters formed a solid sheet of water eight miles wide at Newark. A suspension bridge across the Little Red River at Higden, Arkansas, washed out. Boats had to be sent to rescue people from their homes as far north as Poplar Bluff, Missouri, and as far south as Clinton, Arkansas. Relief workers cared for refugees in boxcars at Brighton and at Bard in Arkansas. Employees of the Arkansas Power and Light Company in Batesville carried out a heroic rescue of a family stranded on a White River island near that city. The Red Cross, the National Guard, and the Corps of Engineers all responded to the emergency.[62]

That the Corps helped minimize people's suffering from the flood did not prevent some residents from questioning, perhaps correctly, whether the Corps could have prevented the flood had

it chosen other methods than those specified in the Jadwin Plan. In May 1935 Lieutenant Colonel Eugene Reybold, then Memphis District Engineer, conceded that reservoirs located at the headwaters of the tributaries of the Arkansas might have some positive flood control value.[63] However, in June engineers from the Memphis District staff, cooperating with surveyors for the city of North Little Rock and the 154th Squadron of the Arkansas National Guard, began preliminary engineering work on new levees to protect Little Rock and North Little Rock.[64]

That same month a number of river improvement advocates formed a new association at Little Rock to obtain permanent flood control, develop water power, improve navigation, and secure water for irrigation. This organization, the Arkansas Valley Association, immediately appealed to the Arkansas congressional delegation for help. They suggested that the delegation get the Corps to file its 308 Reports on the Arkansas River with the House Flood Control Committee so that the reports could serve as the basis for discussions of water resource development issues in the Arkansas River basin. The day after receiving the Arkansas Valley Association's telegram containing this suggestion, Representative Terry made an official request to the Corps, and the Corps complied.[65]

Advocates did not limit their agitation for water resource development to calls for action on the Arkansas River. Proponents for development of the White and Black rivers were just as active. Their efforts, however, did not emphasize navigation as did the efforts of the Arkansas River waterway improvement advocates. Rather, the White and Black river activists stressed flood control and power generation exclusively. As early as 1910 the FPC issued preliminary permits for development of hydroelectric power on the north fork of the White River near the present Norfork Dam, and interest in such development continued.[66] The genesis of the Table Rock Dam occurred in the same period; interested parties made the first known investigation of that site for commercial power generation in 1912.[67] From 1933 through 1935 creation of a proposed multipurpose project on the White River near Branson, Missouri, was widely embraced. Advocates intended the project to center on power generation and flood control and to be funded by the PWA.[68] In February 1934 Representative John Miller introduced a bill calling for construction of a comprehensive series of dams and reservoirs for flood control and power generation on the White River.[69] In a move similar to that in Little Rock in June, local boosters of river improvements formed the White and Black Rivers Flood Control Association in Newport in September 1935.[70]

House Resolution 345 of August 1935, which did not become law, reflected the results of all of this river improvement interest. Its authors intended this legislation to serve as the basis for a flood control act. It called for an appropriation of $62,415,000 to be spent on systems of dams, reservoirs, and other flood control projects on the Arkansas, White, and St. Francis rivers. The total proposal called for an expenditure of $125 million in a six-state area with Arkansas receiving almost half of the appropriation.[71]

However, in August the Rivers and Harbors Act of 1935 passed both houses of Congress. This law contained significant provisions for the Arkansas-southern Missouri region. Dissatisfied with the conclusions of the 308 Reports on the rivers in the area, Congress authorized the Corps to perform additional studies and to produce further reports, known as 409 Reports. The studies were to reexamine the possibility of using reservoirs as aids to flood control, which the 308 Reports had previously disapproved, as well as to reevaluate the excessively high costs of the work

ILLUSTRATION 63. Levee break and flooding.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

recommended.[72] The legislation specifically authorized reexamination of the Arkansas and the White rivers in the 409 process.[73]

The Memphis District's Preliminary Examination Report on the White River, conducted as part of the 409 process, was dated 25 May 1936. In it Lieutenant Colonel Eugene Reybold, then Memphis District Engineer, recommended that the Corps make no additional studies of the White River because it was not worthy of further improvement for navigation.[74] Similarly, in the Memphis District's preliminary 409 study of the Arkansas River in Arkansas and Oklahoma, dated 7 October 1936, Reybold reports "that the Arkansas River, Arkansas and Oklahoma, is not worthy of improvement for navigation at this time. No survey is therefore recommended."[75]

These results may have disappointed river improvement advocates in Oklahoma, Arkansas, and Missouri, but they were the only recommendations the Corps could make in accordance with congressional guidance. In 1927, when Congress had authorized the 308 Reports, it had charged the Corps to recommend hydropower, flood control, and irrigation improvements only for streams that required navigation improvements and on which waterpower appeared practicable. Few thought the White River needed navigation improvements, and area residents did not even raise the issue. However, the Flood Control Act of 1936, building upon the 1917 and 1928 flood control acts, made flood control a national interest. It authorized hundreds of projects, broadening the Corps' area of responsibility and justifying the agency's involvement in single-purpose flood control projects. Henceforth, flood control joined navigation as one of the Corps' primary missions. Meanwhile, the 1936 Overton Act, passed a week before the flood control act, significantly modified the Jadwin Plan, adding more projects and modifying others. Subsequent to passage of the Overton Act, Memphis District submitted a comprehensive report on the Arkansas River, which it had prepared earlier.

Congress Acts in 1936

The Overton Act ordered the Corps to construct reservoirs to control flooding in the drainage basins of tributaries of the Mississippi River. The act appropriated $272 million in addition to the balance from the 1928 act for performing the work it requested for the Mississippi itself.[76] With the Flood Control Act of 22 June 1936 Congress finally dropped, as far as the Corps of Engineers was concerned, its reliance on the commerce clause of the Constitution as the sole justification for federal waterway improvement. Invoking the general welfare clause of the Constitution, Congress finally freed the Corps on a national basis from its statutory mandate to make the primary justification and intention of all its projects improvement of waterways as an aid to navigation.[77] The Corps could now accept projects that were primarily flood control or for other appropriate purposes on rivers located anywhere in the country. It could now design projects, as its rival federal water resource agencies had been authorized to do for thirty years, the purposes of which were accomplishable under mutually compatible engineering premises, even if those means precluded navigation on the subject waterway.[78]

The Flood Control Act of 1936, moreover, specifically authorized approximately 270 projects, 73 of which were in the Arkansas and White river basins.[79] Forty-eight were construction projects, including six upstream reservoirs.[80] Meanwhile the Overton Act had already significantly increased the Memphis District's work load. The Memphis District's responsibility, spread as it was through nearly two hundred thousand square miles, was clearly more than could be managed efficiently by a single District office. In addition, much of the work was building high dams and reservoirs, which the staff of the Memphis District had never done; the District was a levee-building and bank and channel stabilization unit. New talents, new approaches, and new orientation were needed for much of the job required. After the flood of 1937 President Roosevelt actively supported implementation of the Overton Act and the Flood Control Act of 1936, and the Corps then received sufficient appropriations to reactivate the Little Rock District and create a new Southwestern Division.

Like its predecessors in 1927 and 1935, the flood of 1937 was a national disaster. It first struck the Ohio River, then inevitably poured into the Mississippi, which crested in January and February 1937. Floodwaters backed up into eastern Arkansas and Missouri, and torrents once again drove people from their homes and communities. The Red Cross, the Corps, and the National Guard again mounted massive relief and rescue efforts. The nation and the President had had enough; the pattern had to be broken. President Roosevelt began to support appropriations large enough for the Corps to take meaningful action. The Corps thus obtained the necessary funds to reopen the Little Rock office, an office essential to implementing its new high-dam and reservoir approach to flood control.

In 1921 these massive Corps flood control efforts would have been hard to imagine. While little work was done in the area that had been the Little Rock District between 1921 and 1938, the Corps laid the groundwork for programs of navigation and flood control improvement that would dwarf, in just a few years, the Corps' accomplishments from the previous 120 years. The enormity of these programs required the rebirth of the Little Rock District.

Chapter VI

Reactivation of the District, 1937-1945

After sixteen years of little activity, water resource development in the region burgeoned in the late 1930s. The Corps' new attitude toward flood control methodology made it an influential power in the decision-making process. The number of proposed projects west of Little Rock made that city a logical administrative center.

As early as 9 December 1936 Secretary of War Harry Woodring publicly stated that enough work existed in the Arkansas and White river basins to reactivate the Little Rock District. He interpreted the volume of work assigned the Corps in the Flood Control Act of 1936 as authorization to reactivate the Little Rock District with an office in Arkansas' capital city.[1] By February 1937 so many people expected the Corps to reopen a Little Rock office that Chief of Engineers Major General Edward M. Markham, a former Little Rock District Engineer, received a spate of letters from owners of Little Rock buildings suggesting their properties as possible office sites.[2] By June local entrepreneurs operating near available office sites were sending telegrams to General Markham advising him on office locations. For example, on 28 June 1937, General Markham received the following telegram:

> Respectfully suggest locating new office near our cafeteria on Capital Avenue near Main Street largest and most popular eating place in this section good food important to health of your personnel Capital and Main is center of restaurants shopping and theater district. [Signed] Frankes Inc.[3]

Within a few days of this telegram Captain Lester Rhodes, the first executive officer of the reactivated District, arrived in Little Rock and secured space for a temporary office: two fourth-floor walk-up rooms in the Board of Trade Building at Second and Scott streets. On 30 June 1937 the new District Engineer, Lieutenant Colonel Stanley L. Scott, and seven employees moved into this space with Captain Rhodes. Scott's seven initial employees were Earl R. Martin, Erwin D. Blakney, W.H.S. Snyder, Herman C. West, Dora Pasink, Dewey Pierce, and Roberta C. Martin.[4] Within nine days, the staff numbered fifteen or twenty, many of whom became long-term District employees.[5] The Corps transferred purely administrative personnel from Memphis. Reflecting the Corps' new attitude toward upstream dams and reservoirs in the selection of its first technical staff members, the District recruited from Fort Peck, Montana, where the Corps had just completed an upstream dam and reservoir.[6] Meanwhile, District staff arranged to have space in the old Gay Company Building on Third and Broadway remodeled, and in August transferred its offices to this space.[7]

A Remarkable Number of Projects Over an Enormous Area

Even growing at this rate, the District staff was pressed to complete its work. As of 1 July 1937 the Little Rock District was responsible for construction of 47 of the approximately 270 flood control projects authorized by the Flood Control Act of 1936.[8] It had jurisdiction over all the area drained by the Arkansas River and its tributaries above and exclusive of the city of Pine Bluff, except for the area drained by the South Canadian River and its tributaries whose mouths were west of the Texas-New Mexico state line. The District also had jurisdiction over all areas drained by the White River and its tributaries above Peach Orchard Bluff and all the areas drained by the Red River and its tributaries above Fulton, Arkansas. Consequently, the northern and western portions of Arkansas, the southwestern portion of Missouri, the southern part of Kansas, all of Oklahoma, the southeastern portion of Colorado, and small portions of Texas and New Mexico were included in the Little Rock District.[9]

In addition to authorizing the forty-seven construction projects, the Flood Control Act of 1936 authorized preliminary examinations and surveys and continued surveys and studies of twenty-five other projects in the region.[10] In April 1937, three months before the Little Rock District was reactivated, the Memphis District submitted regional flood control plans including the results of some of these studies.[11] With the Flood Control Act of 28 June 1938 Congress authorized the Little Rock District to begin a program of flood control in the Arkansas and White river basins in accord with the 1937 Memphis District plans.[12] Congress thus added construction of fifteen more upstream dams and reservoirs to the Little Rock District's work load. The District could not simultaneously manage sixty-two construction projects while conducting the studies and preparing the reports Congress required. President Roosevelt had noted in his message approving the Flood Control Act of 1938 that although the act authorized a large number of projects it did not appropriate the money to do them all.[13]

By midsummer 1938 the Little Rock District staff was working simultaneously on eight upstream flood control reservoirs and a comprehensive basin report for the Red River while constructing nine levee and floodwall projects at various locations in Kansas, Oklahoma, and Arkansas and preparing numerous reports for Congress.[14] To do this, District employees worked continuously from 7 AM to 6 PM, with no break, and returned to work for two or three hours at night.[15]

The Corps created the Southwestern Division on the same day that it reactivated the Little Rock District. When created, the Division's boundaries nearly duplicated the District's. Its headquarters were also in Little Rock, with offices just a few blocks from the District's.[16] Colonel Reybold commanded the new Division.

As Memphis District Engineer between 1936 and 1937, Reybold had been officer in charge of work in the area which was redesignated the Little Rock District, so he knew the enormity of the tasks that were, by 1939, being worked on by the Little Rock District. In January 1939 Reybold began by subdividing the District. He first established the Denison District to plan and construct the Denison Dam and Reservoir and to complete the comprehensive report on the Red River basin which the Little Rock District had started.[17] In July 1939 he created the Tulsa District and renamed and enlarged the Tucumcari, New Mexico, District to include territory until then a part of the Little Rock District.[18] Reybold established the Tulsa District to complete the Fort Supply, Great Salt Plains, and Hulah reservoir projects in Oklahoma. The Tucumcari District, renamed the Conchos District, assumed from the Little Rock District responsibility for the Caddoa Reservoir project in Colorado as an addition to its continuous responsibility for construction of the Conchos Dam and Reservoir in New Mexico.[19]

The Work Load Grows

Though relieved of these responsibilities in 1939, the Little Rock District staff was still stretched to its limits in the spring of 1940 when the District began simultaneous construction projects for four upstream flood control reservoirs: Nimrod Dam and Reservoir, Blue Mountain Dam and Reservoir, Clearwater Dam and Reservoir, and Norfork Dam and Reservoir. These four major projects were under construction in the District by September 1940 when Congress authorized the Secretary of War to transfer some defense construction to the Corps of Engineers.[20]

As early as 1936 American leaders, seeing the potential for American involvement in a major European war, began a major rewriting of the nation's military preparedness plan.[21] In 1938 Harry Hopkins, an influential New Deal adviser, planned that the Works Progress Administration (WPA) should perform construction associated with preparedness and rearmament. In an attempt to keep the work from the WPA, officers in charge of the Quartermaster Corps made an issue of who controlled emergency construction. Then, proponents for transferring military construction to the Corps of Engineers advanced their causes. By late 1938 President Roosevelt favored, with some reservations, the transfer of all military construction to the Corps of Engineers if the transfer could be accomplished without a fight with Congress, which might jeopardize his other programs. The Corps and politicians took some time, however, to implement this decision.

As part of the negotiations behind Roosevelt's decision to transfer military construction to the Corps of Engineers, the Corps agreed to have the WPA actually perform, under Corps supervision, some construction associated with preparedness and rearmament. Since passage of the Flood Control Act of 1936,

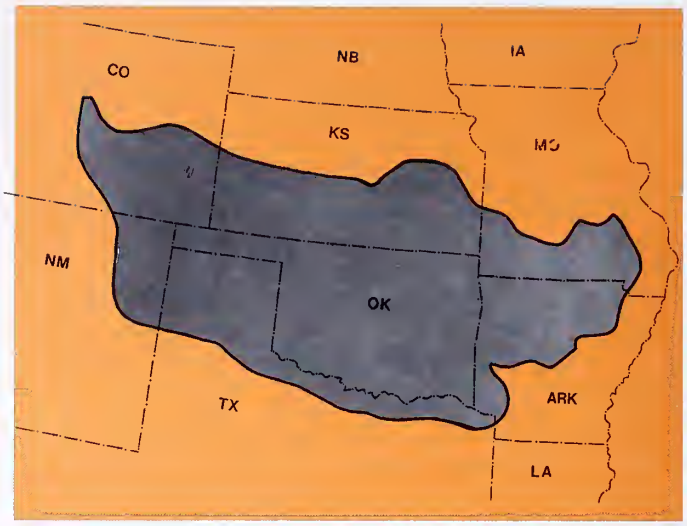


ILLUSTRATION 64.
Official 1937 boundaries of Little Rock District.

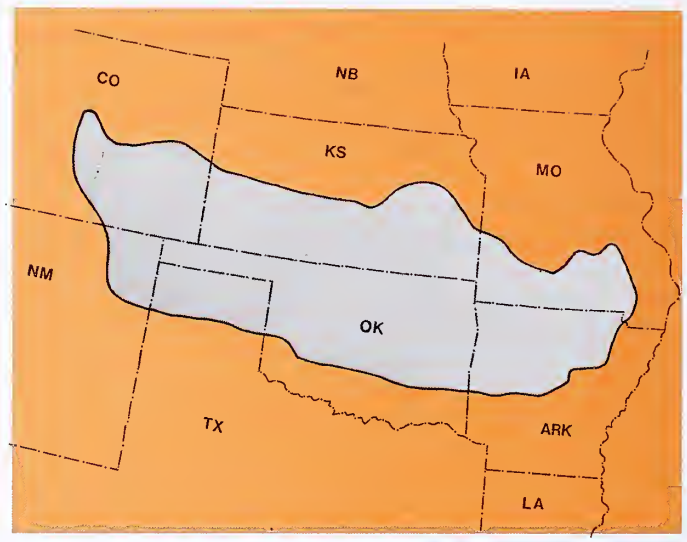


ILLUSTRATION 65. Official January 1939 boundaries of Little Rock District.

ILLUSTRATION 66. Official July 1939 boundary of Little Rock District.

the WPA had been performing and funding flood control construction work under supervision of the Corps of Engineers.[22] These precedents led to the President's late-1938 decision to have the Corps supervise all WPA construction projects. Once he made this decision, Roosevelt rapidly came to support, with some reservations, the Corps' retention of all its traditional civil work functions.[23] This ended the threat of removal of civil works functions from the Corps which had marked the 1920s and 1930s.

The first military construction tasks the General Staff assigned the Corps of Engineers were outside the United States. As a result of the Destroyers for Bases Agreement with Great Britain, the United States got permission to build military bases in the Caribbean and in Canada.[24] The Secretary of War gave the Corps responsibility for construction of these bases. However, on 13 November 1940 the General Staff gave the Corps an even larger assignment. The Corps assumed responsibility from the Construction Division of the Quartermaster Corps for building all facilities needed by the Army Air Corps. The Quartermaster Corps relinquished the projects it had started, and the Army Air Corps identified new assignments for the Corps. By March 1941 the Corps managed eighty-one Air Corps projects, with an estimated cost of $200 million. By 1 April 1941 the Corps had completed all air base construction projects the Quartermaster Corps had relinquished. All war construction projects the Corps of Engineers had left to complete were authorized after November 1940. The Corps had been in charge of these projects since their inception.

In January 1941 the Little Rock District actually undertook military construction as a result of this Corps-wide assignment. Its offices occupied the entire Gay Company Building and three floors of the Professional Building as well as a mapping section at 307-309 Broadway and a warehouse at Fourth and Spring streets in Little Rock.[25] The staff had grown to about nine hundred people because of the District's 1937-1941 civil works work load. Even with this staff, however, considering the combined volume of military and civil work facing the District, Colonel Thomas F. Kern, who assumed command of the Little Rock District on 18 December 1940, had to exercise creative balancing of assignments to get jobs done.

The District had four upstream dam and reservoir projects under construction when Kern assumed command: Nimrod, Blue Mountain, Clearwater, and Norfork. Nimrod and Blue Mountain were two of nine upstream dam and reservoir projects included in the flood control plan for the Arkansas River and its tributaries that the Memphis District had developed in 1937.[26] Clearwater and Norfork were two among six upstream dam and reservoir projects included in the flood control plan for the White River and its tributaries which the Memphis District had developed at the same time.[27] Congress authorized construction of these four, along with the construction of eleven other dams and reservoirs in the two plans, in 1938.[28]

Construction started first on Nimrod Dam. Cradled between the Ouachitas and the Ozarks on the Fourche LaFave River, it was the smallest of four dams the District was building simultaneously. The concrete-gravity structure, begun in April 1940, has a maximum height of 97 feet with a crest length of 1,012 feet. Although Blue Mountain Dam is an earthfill structure, it is larger than Nimrod, rising to a maximum height of 115 feet with a 2,800-foot length. Clearwater Dam, also an earthfill structure, is bigger than Blue Mountain; it is 154 feet tall at its highest point and 4,225 feet long. Norfork Dam, like Nimrod, is a concrete-gravity structure; it, too, dwarfs Nimrod. Norfork Dam has a maximum height of 220 feet and is 2,700 feet long.

In terms of construction time and project size, Nimrod Dam was closest to completion in January 1941. Therefore, the District concentrated efforts on this dam so that at least one job would be completed, allowing staff more time to concentrate on war-related tasks.[29] The strategy worked. The District completed Nimrod in March 1942 just as stateside military construction peaked.

With the dam complete, Nimrod Lake began to pool behind it. Nimrod was the first Corps of Engineers-created lake in Arkansas. It covers 3,600 acres and has a 77-mile shoreline when at its lowest level. At its maximum extent it has a surface area of 18,300 acres and a 124-mile-long shoreline. Because of this routine fluctuation in its shoreline, private developers have not built houses along this reservoir as they have at many other Corps reservoirs in Arkansas.[30]

This fluctuation allows Nimrod Dam and Reservoir to fulfill its primary purpose of flood control. In September 1985 the Little Rock District estimated that between 1942 and 1985 Nimrod Dam and Reservoir held water that, if allowed to flow uncontrolled down the Fourche LaFave River, would have caused $10,284,000 in flood damages.[31]

ILLUSTRATION 67. Location of civil works projects Little Rock District began construction in 1940.

ILLUSTRATION 68. Nimrod Dam under construction. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 69. Nimrod Dam as completed in 1943. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Norfork Becomes the District's First War Project

After Nimrod, the Corps began Norfork Dam, which is located on the North Fork River in the White River basin of the Ozark highlands of north-central Arkansas. When authorizing construction in June 1938, Congress required that all flood control dams authorized at the time must include facilities to permit future installation of power-generating equipment, if recommended by the Chief of Engineers and the Federal Power Commission (FPC) and approved by the Secretary of War.[32] In June 1939 the Corps allocated funds for the Little Rock District to study the power-generating potential of the other dams and reservoirs it was authorized by the 1938 legislation to construct. Based on recommendations the District developed, the Chief of Engineers and the FPC recommended that Norfork and Nimrod include facilities to permit future installation of power-generating equipment.[33] As a result Nimrod included two penstocks set up for two turbines, and Norfork, four penstocks. The Little Rock District has never installed the turbines, generators, and transformers necessary to generate hydroelectric power at Nimrod.

In August 1941, as the pace of work on Blue Mountain and Clearwater slowed, Congress authorized installation of hydroelectric power-generating equipment at Norfork.[34] This decision, made after the project was under construction, changed the project's status. Completion of the Norfork Dam and Reservoir became the Little Rock District's first war project.[35] Planners and administrators saw the power it was to generate as essential for the coming war effort; thus the District's efforts at Norfork were given military priority. Because the Norfork project received so much emphasis, the dam was ready to provide flood control by June 1943. Once rain and runoff filled the 30,700-acre reservoir to capacity, Norfork Lake, had a shoreline of 510 miles. It was designed, like Nimrod Lake, to fluctuate considerably in its flood control function. However, since 1954 the Little Rock District has operated Norfork Lake such that its size and shoreline have remained relatively stable. The District has, whenever possible, kept the lake full to maximize hydroelectric generating capabilities available to the Southwestern Power Administration at peak demand times. This policy has permitted maximum recreational use of the reservoir and aided the economy of the region.[36]

Despite this policy, Norfork fulfilled its flood control function well. The Little Rock District estimated that from 1943 through 1985 Norfork Dam and Reservoir retained water that, had it been allowed to flow uncontrolled down the White River, would have resulted in $29,849,000 worth of damage.[37]

ILLUSTRATION 70. Dining room of contractor commissary at the Norfork Dam construction project.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

While the contractor was completing the dam itself, workers were also rushing to complete the dam's power generating facilities. In the interest of speed and with a desire to conserve critical materials during the war, the Corps decided to deviate from the 1939 plan for power generation at Norfork.[38] The contractor plugged the inlets to two unused penstocks with concrete. Using one 35,000-kilowatt generator borrowed from Fort Peck, Montana, and "cobbled in, so to speak," the Norfork project began producing electrical power in June 1944.[39] Following the war the District installed a second 35,000-kilowatt generating unit, which began commercial power generation in February 1950. As of 1985 the District had not yet made the two other penstocks operational.[40]

In spite of its reduced generating capacity, Norfork has fulfilled its purpose well. Using two generators, it delivered 214,673,800 kilowatts of electrical energy to the Southwestern Power Administration during fiscal year 1986. In 1985 the District converted controls on the existing Norfork generating units

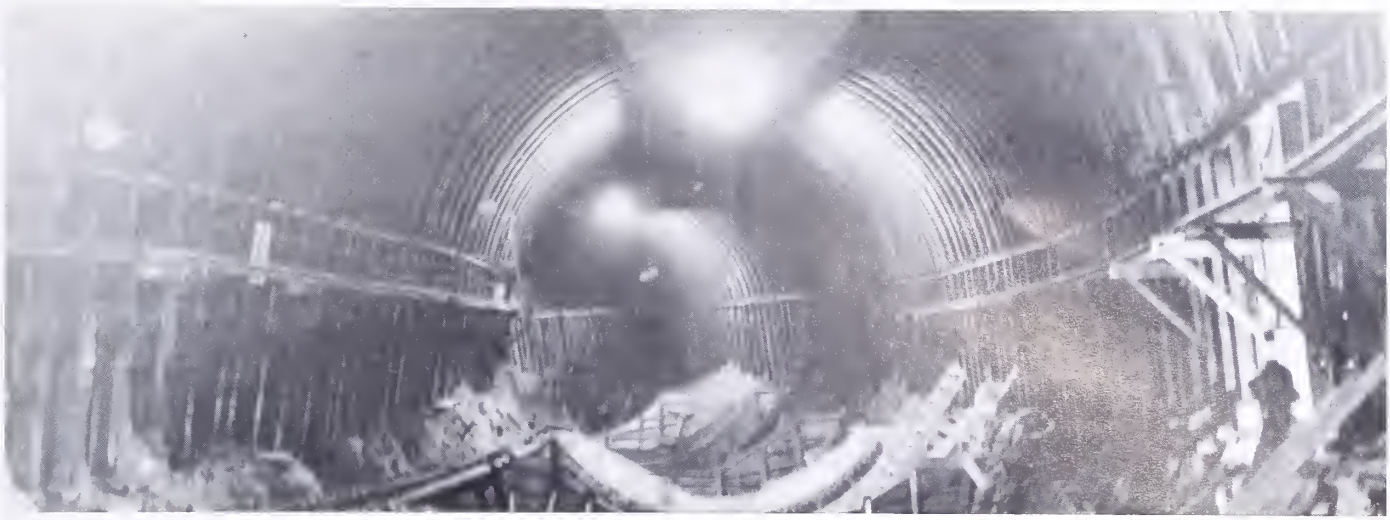


ILLUSTRATION 71. Penstocks at construction of Norfork Dam. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

so that by 1986 they, along with units at Greers Ferry, could be controlled from the Bull Shoals powerhouse.[41]

Bull Shoals Dam and Reservoir is located on the White River within a few miles of Norfork Dam and Reservoir. Congress authorized the Little Rock District to build it in August 1941. In the Flood Control Act of 1928 Congress specifically authorized the Corps to develop two separate sets of plans for the White River: a comprehensive basin plan as called for in House Document No. 308 and a flood control plan utilizing upstream reservoirs. Consequently, in 1928 the Corps began two independent studies of the White River. The Memphis District completed the flood control study in 1930. It then completed the 308 study, which the Chief of Engineers submitted to Congress in 1931. Neither study report recommended constructing upstream flood control reservoirs. However, the flood control study process led the Corps to identify two locations on the White River where construction of upstream reservoirs offered opportunities for useful flood control operations and economical development of hydroelectric power. The plan selected two sites, Table Rock in Missouri and Wild Cat Shoals in Arkansas. In the Flood Control Act of 1936 Congress specifically authorized the Corps to continue studying construction of upstream reservoirs at Table Rock and Wild Cat Shoals. Just as in 1928, Congress in 1936 ordered the Corps to study these two potential projects independently of the general flood control study for the White River basin.

In 1940 the Little Rock District reported to Congress on the Table Rock and Wild Cat Shoals projects. The outcome of the New River case, in which the U.S. Supreme Court ruled that using the sale of waterpower to recover flood control costs was legal, influenced the District's thinking.[42] The District concluded that the Wild Cat Shoals dam site did not have satisfactory foundation conditions, and it recommended the Bull Shoals site. It further recommended that Bull Shoals, together with the Table Rock project upstream from it, be constructed to supply flood control, hydroelectric power generation, and other beneficial uses.[43] These two dams and reservoirs would be in addition to the six upstream dams and reservoirs called for in the White River Basin Flood Control Plan developed by the Memphis District in 1937. Norfork and Clearwater, the two White River basin dam and reservoir projects which the Little Rock District was building in 1940, were components of the 1937 plan.

With the Flood Control Act of 18 August 1941 Congress added to the Little Rock District's work load by authorizing construction of Bull Shoals and Table Rock as the Corps recommended in 1940.[44] Because of the District's military construction work load at the time of these authorizations, nothing was done at either location for the duration of the war.

Similarly, in August 1941 the District placed less importance on completing the Blue Mountain and Clearwater projects than in January when it decided to concentrate on completing Nimrod. By August the District had not completed Nimrod. It had given Norfork war-project status and had begun building airfields and other small military projects. Nominal work continued at Blue Mountain and Clearwater through 1941 and 1942. In fiscal year 1943 the District halted work on both projects for the duration of the war. By then the District's military construction work load was apparently too great to accommodate civil works projects not vital to the war effort.

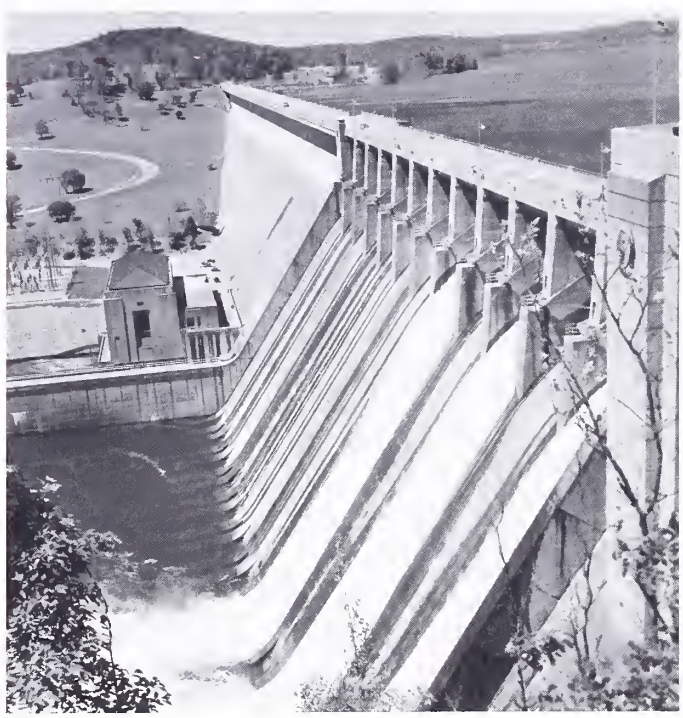


ILLUSTRATION 72. Norfork Dam soon after completion. (Courtesy of Charles F. Butcher)

Airfield Construction

The Little Rock District built over thirty vital World War II airfields, including major facilities at Blytheville, Stuttgart, and Newport in Arkansas and Barksdale Field in Louisiana.[45] By 1941, when the District began building airfields, the Wilcox Act, which governed site selection, construction, and installation of Army Air Corps bases, had been in effect for six years.[46] Federal officials interpreted this act as authorization for the buildup of air bases during the rearmament years preceding World War II. The act established regulations and guidelines governing the process. Because military and congressional officials had already established a pattern of rigid adherence to this act by the time massive military preparedness and rearmament began in the late 1930s, air base site selection was less politically influenced than most World War II domestic military construction.

Basic criteria used to evaluate air base locations throughout the country governed domestic site selection. These included: 1) weather conditions suitable for winter flying even by inexperienced pilots; 2) midcontinental location as a defense against enemy bombardment; 3) location compatible with operating ranges of aircraft to maximize air defenses; 4) flat topography; 5) soil composition; 6) natural drainage characteristics; 7) accessibility; 8) obstructions; and, 9) for combat training, accessibility to bombing and gunnery ranges, many of which were offshore.[47] Eastern and southern Arkansas and Louisiana had more sites that fit these criteria than did many other areas of the country. Much of this land was, so soon after the depression, inexpensive to purchase or lease compared to similar land in other parts of the country.

To assist the war effort, of which air bases were a small part, in March 1942 the Army established three new basic commands: Army Ground Forces, the Army Air Forces, and the Service of Supply Command. The Service of Supply Command under Major General Brehon B. Somervell controlled military construction. During the 1930s, when the Memphis District included what is now the Little Rock District, Somervell had commanded the Memphis District. In July 1942, at the orders of General Somervell, the Corps temporarily expanded the Little Rock District's boundaries to include all of Arkansas and the northern part of Louisiana as far south as Alexandria. However, the District had responsibility only for military construction in this large area. For civil works projects, its boundaries remained unchanged after 1939.[48]

Within the larger military construction area, the Little Rock District had to develop mechanisms to deal with jobs quickly and efficiently owing to the increased volume of air base work. Wherever possible, the District leased existing civil airfields and developed them on the understanding that the improved facility would be returned to its respective municipality when it was no longer needed for the war effort.[49] When new construction was required, the Little Rock District had much of the design work done by private architect/engineer firms.[50] Because the national goal was to produce seven thousand new pilots a year, contractors had to begin building bases as soon as the District accepted the plans. District staff once again worked seven days a week, ten hours a day. Ever since its reactivation the District had sponsored an Army Reserve unit to which many staff belonged. Therefore, it was possible for the Corps to take out of the District office people engaged in planning a project and to put them on duty as officers directing construction of military projects.[51] This saved vital time in familiarizing a new officer with a project and dealing with his ideas for improving it. The officer made on-site decisions quickly and accurately because of his in-depth project familiarity.

The District used this procedure in construction of the Stuttgart Airfield and its satellites. The Corps put Mickey Miller from the District office on duty as a captain to oversee the work. When he started, Stuttgart Airfield was a rice field. The District staff began with survey work, and in a month a worker said, "You wouldn't have recognized the place."[52] In four months it was an airfield.

Construction of an airfield involved building at least two complex runway systems; installing a variety of lights; constructing hangars, barracks, and offices; building and equipping the control tower; and setting up the radio and radar system—a complex job to have completed in four months.[53]

The Little Rock District had to complete Blytheville Air Force Base in a similar period. The War Department authorized the establishment of an airfield in Gosnell, Arkansas, two and one-half miles northwest of Blytheville, in late January 1942. The Army activated the base on 10 June 1942. In the brief four-month interval between authorization and activation the Little Rock District identified, appraised, and purchased 2,670 acres consisting of seventy-three parcels owned by forty individuals, estates, and a church. The District's real estate specialists had to buy each parcel separately and negotiate with each owner individually.[54]

Once the District had purchased the land, it began site development. That the acquired acreage included New Hope Methodist Church's cemetery complicated the process. The Little Rock District real estate staff had to develop a procedure to transform that section of the site to aviation use while simultaneously showing proper consideration for relatives of the interred. The District surveyed the cemetery and divided the area into grids. The staff then located and recorded each grave and monument. District surveyors reproduced the grids on vacant grounds outside the

ILLUSTRATION 73. Little Rock District World War II military functions boundaries.

cemetery, and the staff temporarily moved the 339 monuments and numerous other markers to their relative positions in the new grids. Instead of moving the graves, the construction crew leveled the cemetery and covered each grave, whether marked or unmarked, with a five-inch-thick concrete slab to protect the casket below from further disturbance. When the grading was complete, the crew relaid each marker or monument with the inscription face up and flush with the restored earth surface. In all, the District removed and replaced 1,806 separate pieces. The

contractor sodded and seeded the finished grade, and the Air Force allowed no traffic except rubber-tired movers on the slab.[55]

The Little Rock District began construction on 10 May 1942. When the Army activated the base a month later, the District had in place two temporary macadam runways, storm sewers, drainage, utilities, and a tent city. By April 1943, when the District completed the project, its staff had supervised the construction of 323 buildings and four runways. The buildings were mainly theater type, including 15 officers' quarters, 91 barracks, 2 officers and cadet messes, 4 enlisted messes, a post exchange, a theater, a chapel, 10 hospital buildings, and other normally required buildings. The buildings occupied an area of a little over six hundred acres, and streets conformed to the outline of the runway aprons. Training operations and hangars were located along the aprons. Four cement runways, with taxiways, encompassed the remaining approximately two thousand acres of the site.[56]

Other "Small" Projects

The Little Rock District also began building other so-called small military construction projects at the beginning of 1941. For example, in January the District built a mock warfare training camp west of North Little Rock in Pulaski County between Camp Robinson and Maumelle Ordnance Works. The Army requested the site because it was similar to European terrain where American soldiers would fight. Although the District actually constructed little on the 39,500 acres, land acquisition was very complex. Because of War Department regulations about land used for such purposes, the District had to lease rather than purchase the site. The District called crews working in the Norfork Dam and Reservoir project area to Little Rock, and sixteen work teams composed of two men each spent ten days identifying and recording the properties to be leased for the warfare training camp.[57]

Four appraisers from the Little Rock District assisted by two from the Tulsa District and two from the Vicksburg District estimated relative land and improvement values. The appraisers had to identify everything from the condition of fences to the number of chickens on each property. All improvements were photographed so that damages could be repaired during the leasehold. A crew of government stenographers worked a month preparing lease forms, invoices, and final reports. The Little Rock District real estate section negotiated with the landowners and moved more than twelve hundred people from their homes, some from homesteads occupied for generations by their families. The District relocated all the inhabitants.

The Little Rock District did what it could to minimize the pain and hardship of this relocation. Some of the new temporary homes the Corps found for the dispossessed residents were less comfortable, but some of the new farmlands were more productive. The District forced no family to move more than sixty miles, and, wherever possible, it placed groups together. For example, the District relocated near their church thirty of thirty-two Polish families from the town of Marche. None of these actions, however, totally eased the emotional distress caused by relocations.

While accomplishing such tasks in late 1940 and early 1941, the Army Corps of Engineers built not only an enviable construction capability but also a reputation for performing a high volume of domestic military construction quickly and well. In September 1941 Secretary of War Henry L. Stimson asked that Congress authorize him to assign all military construction, maintenance, and repair of Army structures to the Corps of Engineers.[58] Chief of Engineers Lieutenant General Julian L. Schley was concerned that such reassignment of responsibility might not benefit the Corps. He was apprehensive that the Corps' enlarged construction responsibilities within the continental United States might prevent it from exercising its traditional combat role in the major world war which the nation would soon enter. Therefore, Schley had the legislation amended so that maintenance of Army facilities would stay with the Quartermaster Corps.[59] In late November 1941, soon after Southwestern Division Engineer Lieutenant General Eugene Reybold replaced General Schley as Chief of Engineers, Congress passed the amended bill. On 1 December 1941, six days before Pearl Harbor, President Roosevelt signed the measure into law.

The Corps Assumes All Military Construction

When the reassignment of responsibilities became effective nine days after Pearl Harbor, the Corps of Engineers assumed not only projects started by the Quartermaster Corps and already under way, but also new projects authorized as a result of the United States' entry into the war. By December 1941 the federal government had a disproportionately large number of military construction projects in progress in the Little Rock District.

As Congress authorized new projects, the District continued to receive more work compared to other Corps Districts. This was partially because the geographic area within the Little Rock District's military construction boundaries offered ideal sites for the location of defense-related facilities. Its midcontinental location served as a defense against enemy bombardment, yet it was close enough to the coast that troops stationed there could be used to guard the nation's border. The topography of the area resulted in a variety of climates. This climatological variety meant troops could be trained in differing climates without shipping them long distances. Other advantages in the Little Rock District's World War II military construction area included service by main railroad lines, an ample supply of water, and sufficient electrical power. Its climate, terrain, vegetation, soil, and subsurface conditions also permitted rapid and economical construction. Because the area had not yet recovered from the dust storms and the great economic depression of the 1930s, it also had a suitable labor force available for construction and operation of defense facilities. These economic facts resulted in relatively low land prices compared to those in other, more recovered areas of the country. That the area was still distressed offered national planners additional incentive for selecting a site in the region. By such a choice they were able to further the Roosevelt administration's goal of using the location of defense facilities as a means to spur economic recovery in such areas.[60]

In addition, the Arkansas delegation to Congress was so powerful and had so much influence that Arkansas sites always received an exceptional hearing. The Arkansas World War II-era congressional delegation included J. William Fulbright and John L. McClellan in the Senate and Wilbur D. Mills, James W. Trimble, and Oren Harris in the House. The delegation had seniority, and it also controlled the chairmanships of a number of committees important not only to the Corps of Engineers but also to successive presidential administrations and fellow senators and representatives. Fulbright was a long-time chairman of the Senate Foreign Relations Committee, McClellan chaired the Senate Appropriations Committee, and Mills held the chairmanship of the House Ways and Means Committee.[61]

The Little Rock District performed substantial military construction and received contracts for other national defense work as well. In 1942 the Army awarded the District a defense mapping contract. District mapping staff completed military maps of

strategic potential energy targets such as Buffalo, New York. The staff also made maps of Attu Island, China, and Kyushu Island, Japan, for combat use and updated maps daily to be used in a future invasion of Japan, revising these maps from aerial reconnaissance photographs flown into Little Rock each day.[62]

Before the end of the war, the Army built six camps including Camp Beaureguard in Alexandria, Louisiana; Fort Chaffee near Fort Smith, Arkansas; and Camp Robinson near Little Rock within the military construction boundaries of the post-1942 Little Rock District. The Army began constructing several of these camps well before the District assumed responsibility for military construction in the area. The Quartermaster Corps and its engineering contractor, Black and Veatch, developed Camp Pike near Little Rock during World War I. In August 1937 the Army renamed this facility Camp Robinson. Subsequently, the Quartermaster Corps and Black and Veatch began updating and remodeling Camp Robinson, which included a compact arrangement of regimental areas, short road and utility lines, a centrally located storage depot, and exceptionally attractive landscaping and well-planned site development.[63]

ILLUSTRATION 74. Camp Beaureguard.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Frequently cited as the ideal plan, Camp Robinson became a widely used model for World War II domestic camps. Soon after the massive World War II construction push began, the Quartermaster Corps used the layout of Camp Robinson as one of its prototype plans for developing typical layouts, structural plans, and blueprints that met their standards and requirements. A private architecture/engineering firm hired to design an individual camp adapted the typical layout to a specific site. Constraints offered by the physical site and the need to meet requirements depicted in the typical plan required that camps differ somewhat, thus offering continual challenges to the hired architecture/engineering firms.[64]

As the Camp Robinson typical plan shows, the Quartermaster Corps required that every unit, large or small, remain intact in all Army camps. Companies had to be grouped into battalions, and battalions into regiments. Regimental areas had to adjoin a central parade ground. Hospitals had to be in isolated areas, away from noise and dirt. The Quartermaster Corps also required that storage depots and vehicle parking areas be near railroad sidings or main roads. The Quartermaster Corps also demanded that all one-story buildings be at least forty feet apart and two-story buildings at least fifty feet apart to prevent a fire from spreading. Moreover, firebreaks at least 250 feet wide had to be built at 1,000-foot intervals throughout the length of the camp.[65]

The Quartermaster Corps began Camp Chaffee on the site of a previous military installation. However, unlike Camp Pike (the predecessor to Camp Robinson), Massard Prairie Training Camp, the predecessor to Camp Chaffee, had not been operational for some time when the government acquired the land in September 1941. (The Confederate Cavalry had trained there in 1861.[66])

The Quartermaster Corps began building Fort Chaffee on the flatlands and hills eight miles southeast of Fort Smith in September 1941. The first enlisted men arrived at the camp on 7 December 1941, nine days before the Corps of Engineers began construction of Army camps.[67]

Architecture/engineering firms designed the two prisoner-of-war internment camps, two Japanese relocation centers, and two supply depots built in the Little Rock District to meet requirements very similar to those applied to Army camps.[68] Much of the construction at these facilities, like that at the Army camps, was temporary, with structures intended to last ten years or less. The structures tended to have wood-frame, rather than brick or

ILLUSTRATION 75.
General layout of Camp Robinson. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 76. Entrance to Fort Chaffee.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

concrete block, walls covered with building paper and siding. Interior insulation and walls were often absent. The temporary nature of the structures was also reflected in the electrical systems. The District used the old "mark 2" system in temporary barracks, offices, and warehouses; contractors ran exposed insulated electrical wire from ceramic insulators. In a permanent structure contractors put wire in conduits hidden behind interior walls.[69]

The six ordnance plants and the proving ground the District built during the war had more substantial and complex buildings than the camps and supply depots. Construction of Pine Bluff Arsenal was extensive. Work began in December 1941, with Sanderson and Porter of New York City serving as chief architecture/engineering and construction contractor. They completed construction in the fall of 1943. Sanderson and Porter originally designed the approximately eight-hundred-building, self-contained facility to manufacture magnesium and aluminum incendiary munitions, but the Army soon expanded Pine Bluff Arsenal's industrial function to include production facilities for war gases, smoke munitions, and napalm bombs.[70]

The more than two hundred earth-sheltered, igloo magazines in the northern half of the installation were not impermanent, and the approximately thirty clay-tile warehouse buildings in the chemical plant complex were more substantial than the standard temporary building. Production buildings in the southern part of the installation might appear flimsy but, because of their function, have standard blowout construction featuring steel framing, clay-tile walls, transite roofing, and interior, reinforced-concrete blast walls. However, the initial Sanderson and Porter design included approximately sixty wood-frame buildings in the centrally-located administration compound to be camp-like temporary structures.

The District built Ozark Ordnance Works, ammonium nitrate production plant, at El Dorado, Arkansas, on the construction-manager basis. The project was split into many small fixed-price subcontracts, with an experienced construction firm, the H.B. Deal Construction Company of St. Louis, coordinating the work. Wherever possible the Corps of Engineers used fixed-price contracts for military construction rather than the fixed-fee system the Quartermaster Corps had utilized.[71]

Even though civilian contractors with Army direction and oversight dominated World War II military construction, the Army's work load was considerable. Coordination and oversight of all civil and military projects in the Little Rock District necessitated a substantial increase in District staff. From approximately nine hundred employees in January 1941, the District staff grew to about six thousand by August 1945. When the war ended, the District had to demobilize. From August 1945 until June 1946, while simultaneously reinstating approximately six hundred returning personnel, the District Personnel Branch reduced the overall District staff from six thousand to between seven and eight hundred. Civilian employees who had been drafted or activated with their Reserve units were frequently assigned to civil works projects. In some cases, until the Corps reduced it wartime staff, this meant the District assigned more personnel than needed to some projects. At Clearwater Dam in 1946, the Corps actually needed thirty or forty employees, but because of the need to place returning veterans, the staff there numbered from ninety to one hundred. Although Corps employees outnumbered those of the contractor actually doing the work, such a situation was short-lived.[72]

After the war the District formed a new Army mobilization reserve unit specifically designed to augment the District in the event of war but to avoid the worst of the World War II demobilization problems. The Army disbanded the unit in 1965.[73]

In 1947, after demobilization, the Corps relieved the Little Rock District of its military program responsibilities. The Albuquerque, Galveston, and Tulsa Districts performed all the Southwestern Division's authorized military construction program between 1947 and the outbreak of the Korean Conflict in 1950.[74]

The Corps' military activity from 1941 to 1945 had an impact on the Southwestern Division as well as on the Little Rock District. On 1 February 1941 the Corps transferred the Division's headquarters out of Little Rock. The Chief of Engineers relocated the Division in Dallas, Texas, because the month before he had given it responsibility for three new Districts. The Gulf of Mexico Division had previously been in charge of these Districts, but the Corps discontinued it on 15 January 1941. Dallas was more central to the newly expanded Southwestern Division, which now included Texas, Oklahoma, and parts of New Mexico, Kansas, Colorado, Mississippi, and Arkansas.[75]

Civil Works Cannot Be Forgotten

Though the District and the Division focused on the war effort, neither Congress nor nature would allow them to ignore completely their civil works missions. In 1939 Congress ordered the Corps to review the 1932 comprehensive Arkansas River basin report covering sections of the rivers in Arkansas and Oklahoma. Congress had never authorized any improvement work based on this Memphis District report, but it now charged the Corps with determining the hydroelectric generation potential possible under the 1932 plan.[76] The Corps used its review to conduct a feasibility study for a new multipurpose improvement project for the Arkansas River and its tributaries. Southwestern Division Engineer Reybold established the Arkansas River Survey Board to perform the study. The board, chaired by the Division Engineer, consisted of the Little Rock District Engineer, the Tulsa District Engineer, and a civilian employee of the Southwestern Division. Despite their war-related responsibilities, the board had developed a multipurpose plan for the river basin before war's end. In the post-war years the enormous importance of this plan became apparent.

Meanwhile, the District had floods in 1943, 1944, and 1945. The flood of May to June 1943 was one of the worst in the area's history. At Fort Smith the water was four feet deeper than ever recorded. The District used over nineteen thousand troops and hundreds of German and Italian prisoners from camps throughout the District to fight the flood.[77]

The flood of 1943 led John McClellan, then junior senator from Arkansas, to introduce his Arkansas-White river basin act on 9 November 1943. His intent was to create an Arkansas val-

ley authority similar to the TVA but without a special corporation to operate it. Unlike the Arkansas valley authority plans discussed periodically since early 1937, McClellan's bill left construction, maintenance, and operation of all facilities under the Corps of Engineers. Under the bill, the Secretary of the Interior would sell and distribute electrical power not needed to operate the projects, and he would construct and operate irrigation works in connection with the projects.[78]

Although McClellan's bill did not become law, Congress included many of its provisions in the Flood Control Act of 22 December 1944. That act authorized the Department of the Interior, for the first time, to market electrical power generated at hydroelectric facilities controlled by the Corps of Engineers.[79] The act also established preferences for sale of that power. As a result, the Department of the Interior's Southwestern Power Administration began marketing the power generated at Corps of Engineers facilities in the Little Rock District in 1944, when the Norfork power plant went on-line. In 1977, when he created the Department of Energy, President Jimmy Carter transferred the Southwestern Power Administration to the new department. The administration retained its authorization to market electric power generated at Corps of Engineers hydroelectric power plants. Power generated at these facilities in the District is still delivered over a network of transmission lines owned and operated by the Southwestern Power Administration and by public and private utility systems. The Southwestern Power Administration sells power to municipalities, rural electric cooperatives, and public and private utilities in Arkansas, Missouri, Oklahoma, Louisiana, and eastern Texas.

The Flood Control Act of 1944 contained another provision that was especially portentous for the Little Rock District. Section 4 authorized the Corps to develop and maintain its reservoir areas for recreational purposes.[80] The recreational benefit offered by Corps reservoirs in Arkansas and Missouri has been considerable. Economic consequences of these District projects have been almost as important as the flood control and power generation benefits in the two states. Flood control and hydroelectric power generation remain, however, the primary purposes of the projects.

Section Four of the Flood Control Act of 1944 also marks the beginning of what has been called "the era of the new ideology" in the Corps of Engineers.[81] For the first time since the immediate post-Civil War period, Congress authorized and the Corps accepted non-water-related missions. Since then Congress has changed the civil works role and missions of the Corps dramatically. Slowly at first, but at an increasingly rapid rate, Congress has broadened the scope and range of the Corps' endeavors. By the 1960s, the rate of the expansion of the Corps' new, not necessarily water-related missions, was rapid; however, this did not begin until after 15 August 1945, V-J Day, when World War II ended.

ILLUSTRATION 77. The Arkansas River washed out the Frisco Railroad in Van Buren, Arkansas in May 1943. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

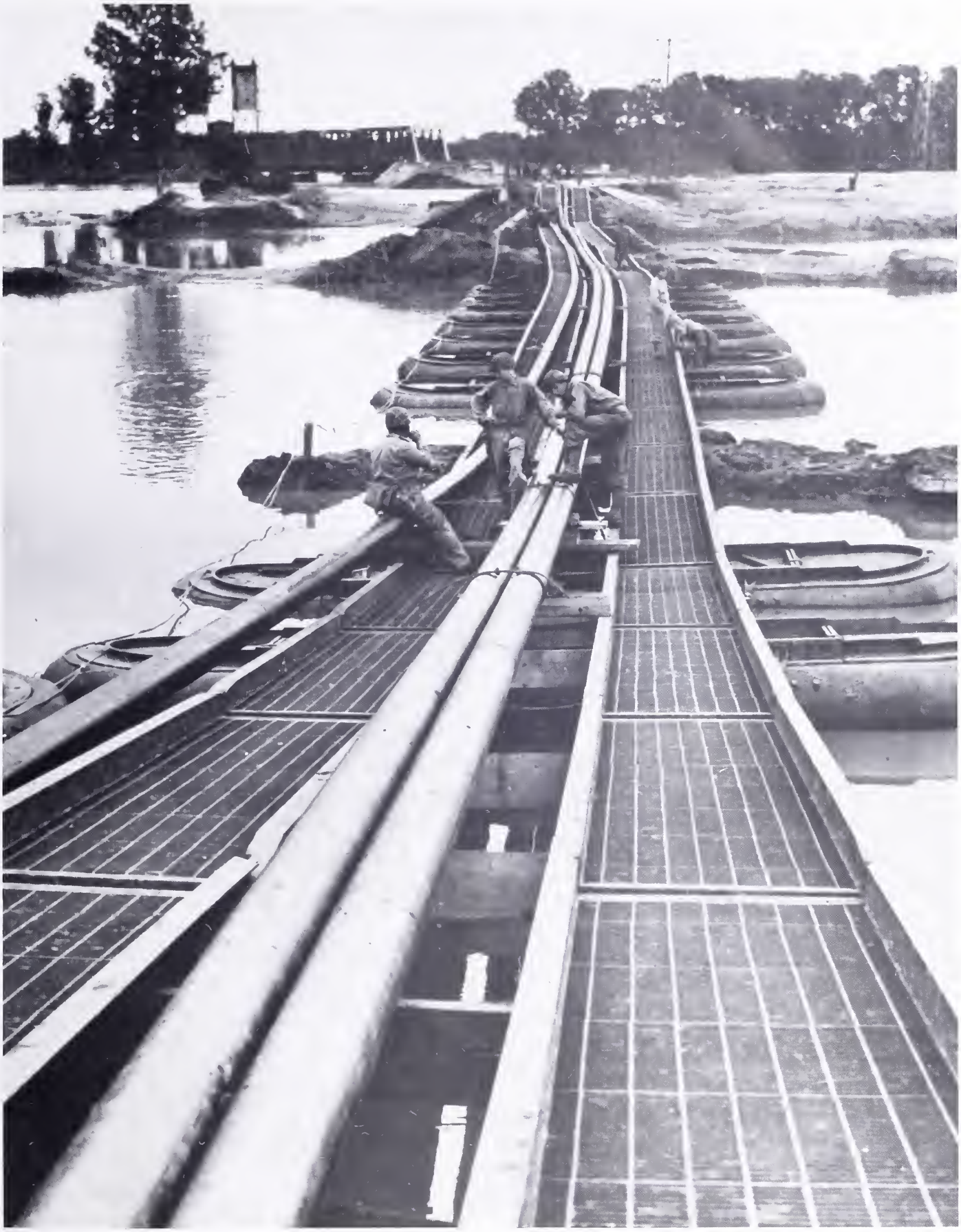


ILLUSTRATION 78. The Army built a pontoon bridge to temporarily replace the Frisco Railroad bridge. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Chapter VII

Re-emergence of Civil Works as the Dominant Activity in the District, 1946-1968

As was true for the Corps of Engineers across the nation, in 1946 the Little Rock District resumed work on projects begun but abandoned during the war. In April of that year the first project resumed was the Blue Mountain Dam and Reservoir.[1] The engineering survey located this flood control project on the Petit Jean River in the shadow of Mount Magazine. After 1944 the Little Rock District added recreation and fish and wildlife features to the plan, and construction progressed without incident. The dam's three flood control gates began operating on 13 May 1947.[2] The lake at Blue Mountain is similar to the one at Nimrod—its size fluctuates greatly. At low water Blue Mountain Lake covers 2,900 acres and has a 50-mile shoreline; at maximum water, it covers 11,000 acres and has a shoreline of about 90 miles. In September 1985 the Little Rock District estimated that between 1947 and 1985 Blue Mountain Dam and Reservoir retained water that, had it been uncontrolled, would have resulted in 18,266,000 in flood damage.[3]

In June 1946 the Little Rock District resumed construction of Clearwater Dam and Reservoir on the Black River in the Ozark highlands of southeastern Missouri.[4] The Corps named this flood control project for a now-abandoned railroad siding four miles downstream from the dam site. Postwar construction at Clearwater was uneventful, and the District completed the project in September 1948 for $9,120,000.[5] Like Nimrod and Blue Mountain lakes, the size of Clearwater Reservoir varies. At its minimum level it covers 1,630 acres and has a shoreline of 27 miles; at its maximum, it has a surface area of 10,350 acres and a shoreline of 172 miles. As at Nimrod, this fluctuation restrained lakeside development while providing flood control.[6] The Little Rock District estimated that between 1948 and 1985 Clearwater Dam and Reservoir prevented $64,513,000 in flood damage.[7]

While contractors were finishing Blue Mountain and Clearwater, the District completed final work on Norfork, which had been omitted because of wartime needs. The District declared the project complete in 1949 at a cost of $28,600,000.[8] Meanwhile in April 1946, the District began construction a few miles away on the Bull Shoals project as authorized in 1941.[9]

Bull Shoals Dam, one of the larger concrete dams in the nation, rises to 256 feet and is 2,256 feet long. The District had approximately fifteen hundred contract employees on the project in addition to the contractor's staff and the District's direct staff.

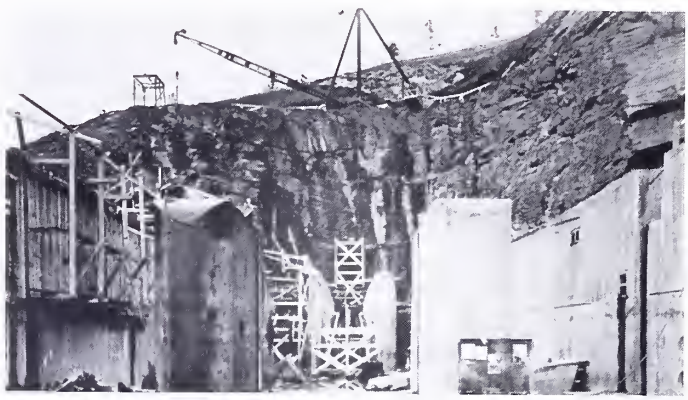


ILLUSTRATION 79. Forebay of Blue Mountain Dam under construction.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

The contractor was Ozark Dam Constructors, whose on-site superintendent was Harvey Slocum, known around the country as Mr. Dam-builder.[10]

The contractor used approximately 2,100,000 cubic yards of concrete, nearly 200,000 cubic yards a month, in the structure. To haul the 3,800,000 tons of aggregate necessary for this volume of concrete, the District had a conveyor belt built from the aggregate quarry in Flippin, Arkansas, to the dam site seven miles away. The contractor built the belt with twenty-one flights, varying from 600 feet to 2,800 feet long. A separate 75- to 125-hp motor powered each flight. The entire system was interlocked and automatic, so that if malfunctions occurred anywhere along the seven miles of terrain and fourteen miles of belt, the entire system stopped until repairs were complete. The giant conveyor belt transported 650 tons of aggregate daily at 525 feet per minute. The contractor manufactured on the right abutment of the dam the 6,651 cubic yards of concrete used in an average day and transported it by rail over a 200-foot-high steel trestle to hammerhead and whirly cranes which placed it in its final position.[11]

Completed 1 November 1951, the dam included eight penstocks for production of hydroelectric power. Contractors began constructing the powerhouse in September 1950 and installing generators in May 1952. On 2 July 1952 President Harry S. Truman spoke at the dedication of the complex.[12] When completed in 1953, the Bull Shoals powerhouse was the largest build-

ing in Arkansas.[13] The first commercial generation of power at Bull Shoals began when generating Unit 1 went on-line in September 1952. The eighth and final generating unit came on-line in September 1963.[14]

In addition to its generating capacity, Bull Shoals Dam actively controls floods on the White River. The Little Rock District estimated that from 1951 through 1985 Bull Shoals Dam and Reservoir prevented $78,988,000 in flood damage.[15]

The District maintains Bull Shoals Lake at approximately 71,200 surface acres with a shoreline of about 1,050 miles.[16] With Norfork Lake this makes more than 100,000 acres of Corps-made lakes and a combined shoreline exceeding 1,500 miles within easy reach of Mountain Home, Arkansas. The creation of these lakes had an impact on Mountain Home and the surrounding region that surpassed all expectations.

When construction began on Norfork in 1941 people expected the government and the contractor payrolls to have only a direct impact on the town and the region. Conditions were desperate in Mountain Home and the surrounding region in 1940 and 1941. The town was a poor agricultural community amidst many failing small farms. In Baxter County, where Mountain Home is located, six hundred farms vanished in the 1940s. Abandoned storefronts in the town outnumbered occupied ones. No new businesses were opening or planned. Per capita income declined to $100 to $200 per year. Wages for common labor were less than 30 cents an hour. Young people were moving away. Chickens roamed the hot, dusty streets of Mountain Home, and pigs rooted in the town square.[17]

A direct influx of money into the local economy offered hope to reverse this situation. Local residents knew the payrolls generated in the area would be spent there. To build the two dams and reservoirs, workers had to move into the area. Commuting was no option; the workers had to spend their money where they lived. As late as 1946, when construction began on Bull Shoals Dam, getting to and from Mountain Home was difficult. It was more difficult to get to and from the construction sites. No one traveled to buy a loaf of bread or a bottle of milk. The closest accessible paved road was thirty-five miles away at Marshall, Arkansas. Separating Marshall from Mountain Home were thirty miles of gravel road and a ferry on the Buffalo River. The bridge across the Buffalo was not constructed until the 1950s. No road connected Mountain Home to Harrison, the largest town in the

ILLUSTRATION 80. Blue Mountain Dam.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 81. Clearwater Dam site.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 82. Government construction workers' village at Clearwater Dam construction project.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

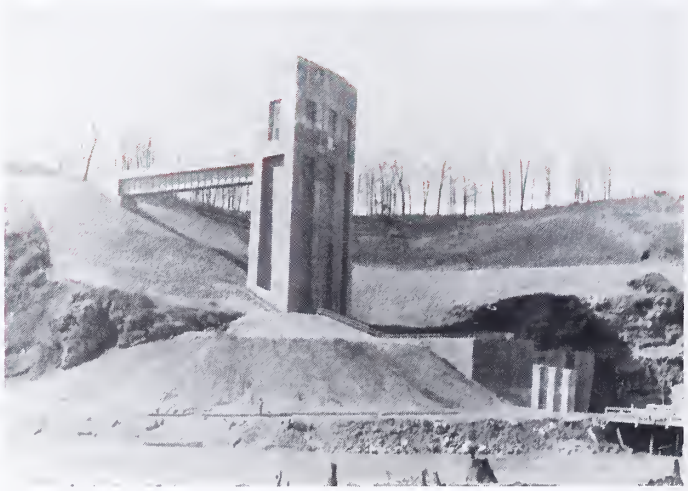


ILLUSTRATION 83. Completed intake at Clearwater Dam.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

area at the time. Harrison, the Boone County seat, is forty-five miles southwest of Mountain Home and forty miles northwest of Marshall. A bridge across a small stream between Harrison and Mountain Home had been out since before World War II and, because of the shortages of materials due to the war, no steel was available to replace it until the late 1940s. The thought that tourists would come to such an isolated spot was beyond consideration in the early- and mid-1940s.[18]

While many travelers visited the resort of Hot Springs during the automobile-borne tourist boom after World War I, few visited the Ozarks. The upsurge in travelers peaked in the 1920s and continued to decline through the Depression until World War II restrictions practically eliminated pleasure travel. Except for Hot Springs and a few other popular areas, the South was not a major tourist region. Moreover, tourists depended on good roads and accommodations, both lacking in the pre-1945 Ozark region. Corps construction of dams and reservoirs changed this situation when tourists resumed traveling after World War II. Roads and services were built to support the construction. Also, media coverage of the region owing to dam construction projects publicized the region's attractions, as did the workers themselves.[19]

ILLUSTRATION 84. Conveyor belt at Bull Shoals Dam construction project.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 85. Aggregate plant at Bull Shoals Dam.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 86. Bull Shoals Dam under construction.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 87. President Harry Truman dedicating Bull Shoals Dam and Lake on 2 July 1952.

(Couresty of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 88. Duplex dwelling in government village at Mountain Home, Arkansas.

(Couresty of the U.S. Army Engineer District, Little Rock, AR)

Because Norfork and Bull Shoals were such large construction projects, they attracted substantial publicity, particularly in midwestern cities such as Chicago, St. Louis, and Kansas City. Even before construction was completed, newcomers and tourists arrived. Once the lakes were filled and fisheries established, tourism boomed. People arrived to establish resorts, develop real estate, and open businesses to provide services and supply commodities for the new and growing population. Many of the now needed, demanded, and desired services and commodities had been unnecessary, unwanted, and unaffordable by the preproject population.[20]

As new business began operating, the city fathers and the most influential residents of the adjoining rural areas realized that the projects offered the area economic development opportunities far beyond the rewards of local government payrolls. Community leaders from the villages and countryside areas joined to promote the twin lakes area for industrial relocation. As a centrally located, scenic area of moderate climate without strong unions and with a tradition of low wages, the addition of recreational opportunities on the scale of Norfork and Bull Shoals reservoirs gave local boosters more to promote.[21]

Some industries did move in; most noticeably Baxter Laboratories in 1961. By 1985 Baxter employed an average of three thousand workers. Retirees moving from Chicago and other cities of the upper Midwest became a more important group of newcomers, however. By 1985 they constituted a larger share of the population than the new industrial workers. This development, like tourism, occurred as soon as the reservoirs were filled. As early as 1959, 117 houses were built in the Panther Bay area of Norfork Lake alone, and each year more expensive and elaborate houses are built. Although the community changed dramatically between 1945 and 1971, the change between 1971 and 1985 has been described as "incredible."[22]

In 1945 thirteen vacation resorts, cottage camps, lodges, hotels, and similar establishments provided overnight accommodations for 108 people in the area; by 1971, three hundred such establishments provided overnight accommodations for 8,339 people. In 1940 a customer could find only seven restaurants, cafes, or public dining rooms in the vicinity. By 1971 eighty-three facilities served residents and visitors. With the influx of relatively affluent older people, the communities upgraded their hospital facilities. Nearly forty doctors and a comparable number of lawyers practiced in the vicinity by 1985. Between 1971 and 1985 six new banks opened in Mountain Home. As the number of people servicing retirement communities has grown, the school system has improved facilities to accommodate a growing younger population.[23]

Korea and the Cold War Interrupt the Flow of Civil Works

Although the work of the Little Rock District was the basis for this economic activity, it did not participate directly and actively in the area's development. Even before the District finished Norfork and Bull Shoals, its energies and attentions focused once again on its military mission. In June 1950 the Korean War began, and by early 1951 the Little Rock District was again responsible for military construction and military real estate for all of Arkansas and the northern half of Louisiana. Thus civil works construction ceased unless a project proved necessary to the national defense.

Unlike during World War II, the District created few new facilities during the Korean emergency. The Little Rock District's military construction was in reactivating, remodeling, adapting, and expanding existing facilities. Its work load was not light: it performed $130 million in military construction between 1951 and 1954 and $65 million between 1954 and 1955. It undertook work at Pine Bluff Arsenal, Barksdale Field, Adams Field, and other sites.[24]

Soon after the Department of Defense reactivated Pine Bluff Arsenal to manufacture incendiary and smoke munitions during the Korean War, the Truman administration decided that American production of biological agents was necessary to deter the use of such agents by the enemy. The Army selected a site near the existing Pine Bluff Arsenal chemical warfare plant for a biological warfare center. Chemists at the Chemical Corps' chemical warfare laboratory developed the process for manufacturing the biological agents; the facility construction contractor built and installed the process and auxiliary equipment. The Chemical Corps provided design criteria for the multistory process building, water treatment plant, steam building with overhead lines to other parts of the site, administration building, laboratory building, large warehouse, loading building, clean and dirty wash houses, shop and automotive building, laundry building, cafeteria, and rehabilitated igloos. The contractor, the chemical division of Blaw-Knox Corporation, Pittsburgh, completed the overall design using these criteria.[25]

The Little Rock District served as coordinator between the Chemical Corps and Blaw-Knox, a normal Corps function in military construction. (The Corps serves as the design and construction agent for the armed forces. A military service or branch gives the Corps a concept of what it needs or will use. The Corps designs and awards the construction contract, manages the project to completion, and returns it to the original service or branch.[26]) Little Rock District project engineer Arthur Carlson supervised the hiring, personnel management, materials and equipment purchase and use, and construction operations during the Pine Bluff Arsenal reactivation. Progress, security, quality of work, and changes were the District responsibilities, and all payments to the contractor required prior District approval. Most District project staff were experienced; they were transferees from the nearly complete Bull Shoals project.[27]

Actual project work began with construction of roads to and within the site, streets, a railroad, storm water and sewer lines, and site grading. The condition and character of the site greatly hindered this work. Approximately six feet of silty loam covered an impervious layer of hard pan. The weather was also unusually wet during the early stages of the project. Progress accelerated considerably after Blaw-Knox completed the initial phases. During the height of the work the District and Blaw-Knox had about five thousand people on the job. All were union members because regulations required that the job be operated on a closed-shop basis.[28]

From 1950 until 1952 the crews worked two nine-hour shifts, six days a week. As work scaled down in 1952, Carlson and Blaw-Knox eliminated the night shift and cut the day shift to five eight-hour days. Blaw-Knox essentially finished the work in November 1953, and most Little Rock District workers moved to construction at Little Rock Air Force Base.

The biological warfare center operated from 1953 until 1969 when the Nixon administration renounced biological warfare. In 1972 the federal government removed the five-hundred-acre complex from Pine Bluff Arsenal's jurisdiction, renamed it the National Center for Toxicological Research, and made it part of the Department of Health, Education, and Welfare.

Simultaneously with Korean War-related works, the Little Rock District assumed other national defense-related tasks. For example, in 1951, for some of the same reasons favoring selec-

tion of the area for a disproportionate number of World War II-related facilities, the District conducted a nuclear reactor site selection survey for the U.S. Atomic Energy Commission. The District offered good potential nuclear reactor sites because of its strategic midcontinental location, abundant water supplies, and trained labor pool.[29]

As Korean Conflict-related construction lessened, the Little Rock District's two biggest military projects were construction of Little Rock Air Force Base, which started in 1953, and site selection and land acquisition for Nike-Hercules and Titan II missile sites, which the District did in 1959.[30]

Congress authorized construction of Little Rock Air Force Base in July 1952. The Little Rock District built the base on land in Jacksonville, Arkansas, given to the Air Force by the Pulaski County Chamber of Commerce. Because of this fairly unusual procedure in a project of this magnitude, District staff did not have to acquire the nearly sixty-five hundred acres required or relocate the residents. Rather, private citizens bought the land from the 139 owners and dealt with the 104 houses, 44 barns, 2 churches, 3 stores, and 2 industrial plants on the site.[31]

Little Rock District staff designed and managed construction of the project. By 1953 the District had awarded two design contracts: one to Southwestern Engineering Company of Little Rock to design a runway lighting system and the other to Marion L. Crist and Associates, a Little Rock engineering firm, to design, plan, and prepare specifications for the base's water, gas, and sewer systems.[32] Contractors began the first construction work on 6 November 1953; the official government groundbreaking was on 8 December.[33]

The District planned and constructed facilities most needed to perform the base's mission first: barracks, hangars, squadron operations buildings on the flight line, and wing and division headquarters buildings. It then started other structures important to troop morale such as the base exchange, library, theater, dental clinic, and gymnasium.[34]

Construction started slowly because on 15 December, just a week after the official groundbreaking, union picket lines appeared around the base construction site. The contractors found a loophole in the 1912 federal eight-hour law that required overtime pay only for work in excess of eight hours a day. The law made no provision about the number of hours worked in a week, so the contractors had the laborers work eight hours a day, seven days a week, with no overtime pay. The picketing lasted until 6 April 1954 when unions and contractors signed a contract limiting workers to a forty-hour week. The contract also prohibited strikes and lockouts and stipulated arbitration to settle all disputes.[35]

Once the affected parties reached this settlement, the Corps issued invitations to bid on the rest of the construction project. By the end of 1954 the District had work in progress on all types of base facilities and had made some progress on building necessary base housing. On 1 February 1955, when the only finished building on the complex was the Little Rock District project office, the Air Force assigned its first personnel to the base. As soon as the contractors completed the base communications building, the Air Force staff moved in.[36]

The Little Rock District staff, not the Air Force staff, continued to manage construction. District staff responded to construction-related problems such as the 26 April fire in the headquarters and operations buildings. A plumber's torch ignited both buildings, which were partially destroyed. The District estimated damage at $25,000. Despite such emergencies, by 30 June 1955 the District had ninety buildings under construction and was managing project contracts estimated as $30,224,000.[37]

On 1 August 1955 the Air Force activated Little Rock Air Force Base. By the end of the month 65 officers and 398 airmen occupied the base, although construction was incomplete. In September 1955 the contractor completed the main hangar, at the time the largest building in Arkansas. Another strike in November 1955 stopped all work for several weeks. By February 1956, the District completed the base exchange and barber shop. Adverse weather delayed construction throughout the winter of 1957, but by summer 1957 contractors began the dual-access road from the main gate. Many projects were nearly complete by the end of October 1957. The District finished the permanent base exchange, commissary, golf course, and officers' quarters in the summer of 1958. Housing for the more than five thousand people assigned to the base remained incomplete.[38]

Congress authorized construction in November 1955 of the 1,535 duplex housing units needed at Little Rock Air Force Base. Construction began by March 1956. The District awarded the contract for these two- and three-bedroom duplexes to Miles Construction Corporation of California. Miles built the houses in three main groups on 330 acres south of the main gate. It completed the project in twenty-one months despite strikes, misunderstood

ILLUSTRATION 89. Little Rock Air Force Base under construction.

(Courtesy of the Little Rock Air Force Base)

ILLUSTRATION 90. Aerial photograph of Capehart on-base housing project under construction at Little Rock Air Force Base.

(Courtesy of the Little Rock Air Force Base)

orders, bursting pipes, and electrical and heat pump failures. After Miles poured the foundations, it realized the project would cost less than planned. Since it was too late to add more space to each house, the District had Miles add interior features: washers, dryers, dishwashers, disposals, and oak floors.[39]

Although smaller construction projects continued as the government added facilities to Little Rock Air Force Base, the District completed the major project work in 1959. This was fortuitous: the Air Force almost immediately selected Little Rock Air Force Base as a support base for a new group of intercontinental ballistic missiles.

The District located in Arkansas eighteen Titan II intercontinental ballistic missile launching sites in an arc extending from the vicinity of Morrilton to that of Searcy, with the northernmost portion of the arc being near Heber Springs. The District supported the establishment of a construction area office at Little Rock Air Force Base, but the Chief of Engineers transferred responsibility for construction of the missile launch sites and support facilities from the District to the Corps of Engineers' Ballistic Missile Construction Office in Los Angeles. The District continued to provide support in terms of finance and accounting, technical services, and personnel even after 1961 when the Army reassigned military construction outside the District.[40]

The District retained this and other national defense and military construction responsibilities until 1961 when the federal government reorganized the Corps.[41] The Chief of Engineers put the civil works component of existing Districts and Divisions under the newly created Civil Works Directorate in his office. The Corps initiated a new overlapping or parallel system of Districts and Divisions charged with responsibility for military construction. The military construction organization had fewer Districts and Divisions than the civil works system. Thus, in 1961, to reduce administrative costs by centralizing the program, the Corps relieved twelve Districts of their military construction and real estate responsibilities, including the Little Rock District. As an economy measure, the Chief of Engineers transferred the Little Rock District's military mission, along with the military missions of all the other Districts in the Southwestern Division, to the Fort Worth District, simultaneously a military construction District and a civil works District though its boundaries differed for each mission.

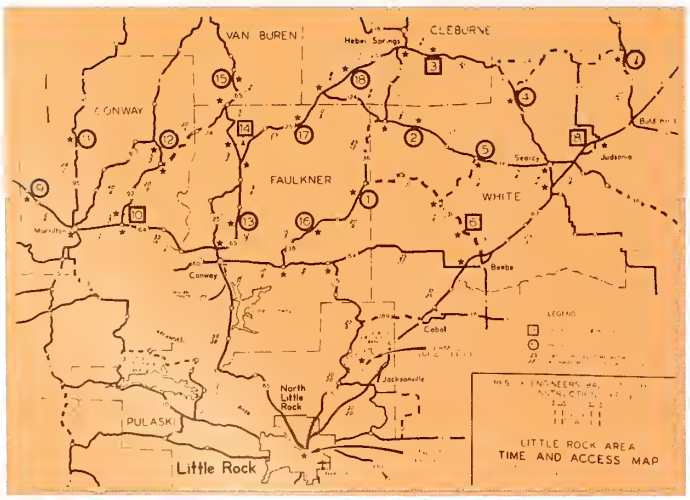


ILLUSTRATION 91. Titan II missile launching sites.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 92. Missile silo under construction.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Resumption of Civil Works Assignments

Despite military mission obligations, the Little Rock District resumed work before 1961 on long-delayed civil works projects. With the height of the Korean Conflict past in October 1954, the Little Rock District began constructing Table Rock Dam and Reservoir.

Located on the main stem of the White River near Branson, Missouri, Table Rock Dam is upstream from Bull Shoals Lake. In the Flood Control Act of 1936 Congress specifically authorized the Corps to continue the Table Rock project independently of the simultaneous White River Basin Flood Control Plan.[42] In 1940, as part of its study recommending construction at Bull Shoals, the Little Rock District recommended construction at Table Rock.[43] Congressional authorization followed on 18 August 1941.[44] However, the District became involved with World War II, then the Korean War. It also needed to complete projects previously authorized and begun. The District decided that Bull Shoals should be constructed before Table Rock. Because Congress had not funded all projects authorized, the District did not begin construction of the Table Rock complex for thirteen years. The appropriations that allowed construction to begin came during the Truman administration. As Tom Epps, former mayor of Branson, Missouri, said, "If we couldn't get started on Table Rock with a Missouri boy in the White House, we might have just as well kicked it out."[45]

Table Rock and Bull Shoals dams are located on the White River, and Congress authorized them simultaneously. Because the demands of the two sites differed, the two dams differ. Bull Shoals is a concrete-gravity dam on a larger scale than the similar and earlier Nimrod and Norfork dams. Table Rock Dam is a combination concrete-gravity and earth embankment structure. Though nearly the same height as Bull Shoals, Table Rock is about three times as long. Table Rock, with a maximum height of 252 feet above streambed, is only 4 feet shorter than Bull Shoals. Its length is, however, 6,423 feet and Bull Shoals' is 2,256 feet. The concrete portion of Table Rock is 1,602 feet long, 654 feet shorter than the totally concrete dam at Bull Shoals.[46]

Like Bull Shoals and Norfork, Table Rock generates hydroelectric power. Because of the project's power pool storage capacity, Table Rock's powerhouse includes four generating units compared to the eight at Bull Shoals and the two at Norfork. Units 1 and 2 at Table Rock went on-line in May 1959, and Units 3

and 4 were added in April and June 1961. Table Rock Lake, with a surface area of about 52,300 acres and a shoreline of about 850 miles, is smaller than Bull Shoals but larger than Norfork.[47] It began effectively restraining flood waters in November 1958. The Little Rock District estimated that from then through 1985, Table Rock prevented $49,729,000 in flood damages.[48]

Although Table Rock Lake is smaller than Bull Shoals Lake or the twin reservoir complex around Mountain Home, the recreational development in the Table Rock area is proportionally as great as that in the area of its older neighbors. Unlike the Mountain Home area, the Branson area had tourism and recreation before the Little Rock District began constructing Table Rock. Tourists and visitors could get there relatively easily and it was also more easily accessible to major population centers such as Springfield, St. Louis, and Kansas City. The area was known for fishing. More than thirty years earlier, shortly after World War I, a private power company had created Lake Taneycomo. The company impounded water behind a privately developed power dam. Rockaway Beach was probably Missouri's first man-made lake resort.[49] Once the Corps completed Table Rock Lake in 1958 and recreational resources increased, tourism in the Branson area escalated. By 1960 Table Rock was termed the "fastest developing lake in the United States."[50] As early as 1967 Little Rock District officials estimated that more development was occurring at Table Rock than at any other reservoir in the District.[51]

The surprisingly rapid growth of resorts and cottages around the lake reflected the changed Corps approach to lake levels. Once the Corps adopted the new approach to reservoir design whereby a lake need not fluctuate greatly to achieve its maximum flood control benefit, it no longer had to buy the land encircling its reservoirs. The land could be developed privately.

Despite the possibility of development around the lake, neither relocated retirees nor relocated industry influenced subsequent development at Table Rock; development proceeded along preproject tourism and recreation patterns. By 1985, weekend visitors and vacationers were more important users of Table Rock than of other Corps projects in the area.

Preproject tourism and recreation interests in the Branson area emerged during the project construction. Only where recreation interests had produced activism would the issue of how much of the reservoir basin to clear create such a controversy. By 1956,

ILLUSTRATION 93. Flood water overtopping Table Rock Dam while still under construction in 1957.

(Courtesy of Jesse W. Story)

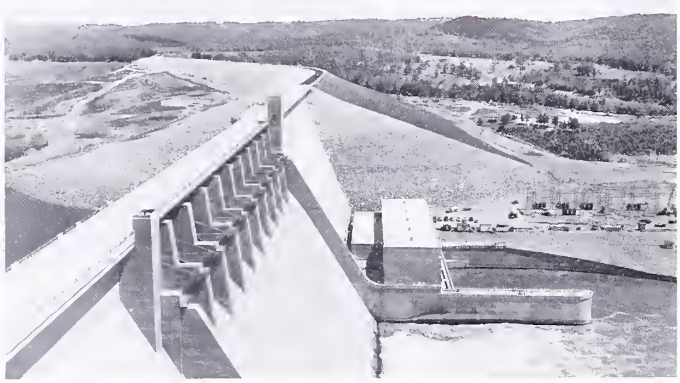


ILLUSTRATION 94. Table Rock Dam complete. Work continues on Power House and Switch Yard.

(Courtesy of Jesse W. Story)

ILLUSTRATION 95. Ozark Dam and Lake Taneycomo under construction.

(Courtesy of the State Historical Society of Missouri)

ILLUSTRATION 96. Anchor Travel Village Tourist Camp in Branson, Missouri, in 1945.

(Courtesy of the State Historical Society of Missouri)

after the Morrison-Knudsen Company, Inc., and the Utah Construction Company had been at work on the project for nearly two years, two definite groups emerged from the local population. Each argued vehemently, based on differing recreationalist perspectives, about the amount of land that should be cleared in building Table Rock Lake. Those representing boating, skiing, and swimming interests argued that all timber in the basin should be cleared. Those representing fishing interests pressed for leaving as much timber as possible to serve as fish congregators. The District's position was that no trees be exposed at low water. It thus favored traditional Corps policy of leaving trees in what would become the deepest portions of the reservoir and of removing the rest. This policy was followed.[52]

After beginning construction at Table Rock, the Corps started another dam and reservoir project, Greers Ferry. Like Norfork and Clearwater, Greers Ferry was one of six projects included in the White River Basin Flood Control Plan authorized by Congress in 1938.[53] As with other flood control dams, authorization required that Greers Ferry include facilities for installation of power-generating equipment, if recommended by the Chief Engineer and the Federal Power Administration and approved by the Secretary of War. In June 1939 the Little Rock District began studying the power-generating potential of Greers Ferry and of other dams authorized in 1938. In 1940 the Federal Commerce Commission authorized further investigation of Greers Ferry, and in 1941 the Little Rock District conducted public hearings.[54] Support was unanimous for the addition of hydroelectric power generation to the project, and in 1954 Congress amended its authorization for Greers Ferry Dam to include production of hydroelectric power.[55] The Corps broke ground for Greers Ferry Dam and Reservoir on 11 June 1957. Although some minor construction activity followed the ceremony, the District did not let a construction contract until February 1959, when it awarded the Morrison-Knudsen Company, one of the contractors just completing the Table Rock project, the construction contract. Morrison-Knudsen sponsored the joint venture with Johnson, Drake, and Piper, Inc., and Henry J. Kaiser Company, operating as the Red River Builders.[56]

The Red River Builders constructed a concrete-gravity dam similar to the Nimrod, Norfork, and Bull Shoals dams. Rising to 243 feet above the streambed, Greers Ferry dam is 1,704 feet long. The top serves as a highway across the Little Red River valley.[75]

Heber Springs, the nearest town and the community that gained most from the Greers Ferry project, already had tourism when construction began in 1957. People came for good fishing and outdoor activities. A picturesque bridge crossing the Little Red River near the site of the present dam attracted visitors statewide. The wooden bridge suspended between towers by steel cables was built in 1912. Accommodating one vehicle at a time, it offered an "exciting" ride. People made special trips from considerable distances just to see and experience the "swinging" bridge.[58]

The area's recreational fishing clientele disputed the Greers Ferry Dam construction details affecting their sport. The controversy was foreshadowed years earlier at Norfork, Bull Shoals, and Table Rock.

Environmental Action, Heritage Preservation, Recreational Development

Although during times of high water excess water passes through a 280-foot spillway section toward the top of Greers Ferry Dam, water is routinely released from the upstream impoundment through two pipes or penstocks that funnel it downstream through the power-generating turbines into the Little Red River.

ILLUSTRATION 97. "Swinging" bridge over the Little Red River.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 98. Greers Ferry Dam.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

As is routine for dams feeding power-production plants, these penstocks draw water from near the bottom of the reservoir, where the depth of the water approximates the height of the dam. Water drawn from the bottom of the 200-foot-deep lake behind Greers Ferry Dam is 48° to 50° F.[59] The routine influx of such cold water downstream lowers the water temperature for a considerable distance.

Like the North Fork and White rivers, the Little Red is relatively warm, supporting smallmouth black bass. The Little Rock District power plants released cold water into the streams and lowered the water temperature enough that bass could no longer live there. The water became so cold in the North Fork and the White that the Little Rock District cooperated with the U.S. Fish and Wildlife Service to introduce trout into these streams. Thus were the first trout fisheries in Arkansas created.

In 1956 and 1957 the U.S. Fish and Wildlife Service built a trout hatchery on forty-four acres of the right bank of the North Fork River downstream from Norfork Dam. The Little Rock District provided land for the hatchery, two residence buildings, a garage apartment, a source of cold water, and the resident engineer during the construction period. The Fish and Wildlife

Service placed the facility in operation in October 1957, when the North Fork River became known for its many fifteen-pound rainbow trout.

The District facilitated the development of the White River trout fishery downstream from Bull Shoals by modifying operational procedures during the release of more than 2 million acre-feet of floodwaters from that reservoir. A large trout hatchery also operates on 211 acres just below Table Rock Dam.[60] This hatchery established one of Missouri's largest, most successful trout fisheries in Lake Taneycomo downstream from Table Rock Dam.

In taking these actions well before the National Environmental Protection Act of 1969, and even before the passage of the Fish and Wildlife Coordination Act of 1958, the Little Rock District became a pacesetter in the Corps of Engineers' campaign of sensitivity to environmental, cultural, and recreational issues. As early as the 1950s the Southwestern Division, particularly the Little Rock District, established policies for reservoir construction and operation used by the entire Corps.[61] The Division and the District achieved this preeminence because they had so many reservoirs operating, being constructed, or being considered.

ILLUSTRATION 99. Table Rock Fish Hatchery.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Not only did the Little Rock District participate early in environmental decisions, it participated even sooner in cultural resource activities. In 1935 Congress, building on the Antiquities Act of 1906, provided for the preservation of historic resources of national significance. The Historic Sites Act of 1935 increased accountability of federal agencies for any potential impact of their actions on nationally significant archaeological, cultural, and historic resources. It assigned broad powers to the Secretary of the Interior and the National Park Service. As a part of this authorization Congress made the National Park Service responsible for surveying, documenting, evaluating, and preserving the legislated resources possibly impacted by actions of other federal agencies.[62]

The provisions of the 1935 act affected the Little Rock District as soon as the Corps reactivated it. The upstream reservoirs Congress authorized would impact any archaeological, cultural, or historic resources existing in the project areas; the resources would either be destroyed in the process of building the dams or be buried beneath thousands of gallons of water. As a result, the federal government put hundreds of National Park Service personnel to work on archaeological investigations associated with the large reservoir projects. Because of the extent of the National Park Service's responsibility and the number of public works projects undertaken in this phase of the New Deal, archaeological investigations associated with the Little Rock District's project (as with projects all over the country) often started just in advance of construction. Unlike modern archaeological investigation programs, these early federal projects did not arise from a planned program for research, preservation of resources in *situ*, or data collection. As appendages to existing programs or projects they tended to be motivated by a concern to salvage the archaeological record before modern development could irrevocably change or destroy it.[63]

In this early period of historic preservation, the federal government prepared no surveys of historic architecture affected by the dams. In the 1930s and 1940s, the professional community had not yet recognized the value of vernacular and folk architecture. The kinds of buildings and farmsteads destroyed or flooded by District projects in Arkansas and Missouri were generally such resources. Historic building survey and documentation of the period tended to concentrate on high styles and the works of well-known architects or on buildings associated with prominent individuals or important historic events.

Salvage archaeology continued following World War II when the reservoir projects resumed. The National Park Service, in cooperation with the Smithsonian Institution, coordinated an interagency archaeological salvage program to collect data from sites that would be permanently lost to flooding or dam construction.[64] By 1954 the University of Missouri was performing, on a contractual basis, the District's archaeological salvage program at Table Rock.[65] Beginning in 1957 the University of Arkansas Museum in Fayetteville began excavations in Arkansas at Table Rock, Greers Ferry, and Beaver.[66] Although as late as 1958 Smithsonian staff directly conducted archaeological investigations at major sites such as at Dardanelle in the Little Rock District, local contract archaeologists increasingly assumed the work.[67] The University of Arkansas Museum's role continued even after Congress, in the Reservoir Salvage Act of 1960, assigned the Department of the Interior major responsibility for preserving archaeological data lost through federal dam construction.[68] In 1967 the state created the Arkansas Archaeological Survey, which began operating a statewide, coordinated research program. It conducted, on a contract basis, much of the necessary research at Little Rock District sites.[69]

Provision of recreation is another area outside its missions of water resource development for navigation, flood control, and hydroelectric power generation. As early as 1871 some of the Corps' officers drew the attention of Congress and the nation to the Yellowstone geyser area and the need to preserve it. The Corps began actual environmental engineering in 1883 when Congress gave it responsibility for designing and maintaining roads in the National Parks. However, not until 1944, except for some limited road design work at Hot Springs National Park, did this function become important in the Little Rock District.

Section 4 of the Flood Control Act of 22 December 1944 authorized the Corps to develop its reservoirs for recreational purposes.[70] The 1946 authorization for the Arkansas River multipurpose project included recreation as a major component of the project.[71] Since then, recreational development at all Little Rock District facilities has grown from an incidental amenity to a major program, with the District becoming known for imaginative and innovative management.[72]

As early as 1946 the District prepared and began implementing master plans for recreational development and reservoir utilization.[73] These plans supplemented existing operations and

maintenance plans. By 1958, when the District was preparing for construction at Greers Ferry, Chief of Engineers Major General Emerson C. Itschner acknowledged that in performing its civil works programs the Corps created one of the most important recreational resources in the United States. He expressed concern that recreational features of the civil works program were being neglected and ordered his staff at all levels conscientiously to conduct the recreational aspects of civil works programs. General Itschner wanted the Corps to recognize recreation as a tangible, important function of water resource development even though it could not be used in the official cost-benefit justification for Corps projects.[74]

General Itschner's message was certainly not lost on the Little Rock District. Its experience proved the Chief of Engineers' point. By 1955 more than 1.5 million people annually visited Bull Shoals reservoir and used its Corps-developed recreation facilities. Other Corps visitation statistics included Norfork at 850,000, Nimrod at 230,000, and Blue Mountain at more than 213,000, all in Arkansas, as well as Clearwater in Missouri, with 280,000.[75] Designers included recreational development in the Greers Ferry plans before construction began in 1959.

By the Fish and Wildlife Coordination Act of 1958, Congress tried to ensure that federal agencies, including the Corps of Engineers, recognize the environmental effects of proposed projects and activity.[76] As demonstrated at Norfork, Bull Shoals, and Table Rock, the Little Rock District not only recognized the potential effects of its actions, it also developed procedures to mitigate their consequences. Only after 1967 did the Corps accept the spirit and letter of this law and demonstrate environmental awareness in its operations throughout the country.[77]

Controversies Begin

The Little Rock District had developed its position and established its sensitivity to environmental and recreational issues by 1959 when construction began on Greers Ferry. However, as the contractor began to remove trees from the reservoir area, fishermen and fishing groups expressed concern about tree removal. The District planned to have 35 percent of the reservoir cleared to remove timber predicted to be exposed when the lake was at its lowest. Some fishermen and sportsmen wanted more clearing done, but when they understood Corps plans, most realized the submerged trees offered an advantage to spawning fish and served as fish congregators. Eventually, after a substantial delay in work, an acceptable compromise was reached.[78]

Then, in 1960, an even greater controversy arose. Gus Albright, a member of the Arkansas Game and Fish Commission; W.M. "Bill" Apple, a correspondent for the *Arkansas Democrat*; and William J. Allen, a South/Central field representative of the Wildlife Management Institute, led a campaign to change the design of Greers Ferry Dam. They demanded the Corps redesign the dam so that water released from the top of the reservoir would mix with that released from the bottom of the pool. Their demand was meant to ensure that the temperature of the water entering the downstream reach of the Little Red would not be so cold that it would kill the native smallmouth bass. These men felt that by killing the bass, even if replaced by trout, the region would be stripped of its prime fishing attraction. The ensuing controversy nearly ended the Greers Ferry project. For the Corps to have accommodated the bass fishermen's request would have cost over $6 million.[79]

Colonel Arthur M. Jacoby, Little Rock District Engineer, proposed a compromise. He suggested that the District provide land, just as it had at Norfork and Table Rock, immediately downstream from the dam and that the U.S. Fish and Wildlife Service build yet another trout hatchery. This would cost the taxpayers only about $800,000.

The Corps adopted Colonel Jacoby's suggestion, and in 1966 the Fish and Wildlife Service completed a hatchery on thirty-two acres of land on the left bank of the Little Red River downstream from the dam. Today, the reach of the river below Greers Ferry Dam is nationally and internationally known for its trout fishing, while Greers Ferry Lake itself is known for native bass fishing. By 1982 Greers Ferry was the seventeenth-most visited Corps project in the entire nation.[80]

The Little Rock District completed Greers Ferry Dam in December 1962. The reservoir that filled behind it consists of two lakes connected by a water-filled gorge called the Narrows. The area of the two lakes and the Narrows totals about 40,500 acres with a combined shoreline just over 340 miles.[81] As soon as the reservoir began to fill, it began to serve its flood control purpose. The Little Rock District estimates that from 1962 through 1985 Greers Ferry Dam and Reservoir prevented $16,776,000 in flood damages.[82]

The two generating units in the Greers Ferry powerhouse went on-line in March and May of 1964.[83] Since then, Greers Ferry had delivered about 150 million kilowatt-hours annually to the Southwestern Power Administration.[84]

As at Bull Shoals, neither the Corps nor local supporters wanted to wait until the generators were installed and operating before dedicating Greers Ferry. The Heber Springs Chamber of Commerce organized and staged the ceremony. They invited President John F. Kennedy to serve as the principal speaker. The President's acceptance of the invitation reflects the fact that, as he explained in his dedication speech, in 1963 "pound for pound, the Arkansas delegation in the Congress of the United States wields more influence than any other delegation of any of the other 49 states."[85] Representative Wilbur D. Mills, in whose congressional district the Greers Ferry project lay, was particularly influential in getting Kennedy to attend the ceremony.[86] The dedication occurred on 3 October 1963, just ten days after Congress passed Kennedy's big tax bill. Mills, as chairman of the House Ways and Means Committee, was instrumental in accomplishing this administration initiative. The *New York Times* concluded that had Representative Mills suggested it, President Kennedy would have been glad not only to come and dedicate the dam, but to sing "Down By the Old Mill Stream" while he was doing it.[87] President Kennedy's appearance at the Greers Ferry dedication ceremony was his last major public appearance before his ill-fated trip to Dallas, Texas, on 22 November 1963.

In his remarks in Heber Springs, Kennedy explained that the Greers Ferry project and others like it were investments in Arkansas' and the nation's future. The projects, he said, produce wealth and bring industry and jobs to areas where they are located. They increase local area residents' abilities to purchase products produced in other parts of the country. Thus, wealth is produced, and industry and jobs are created or retained throughout the nation. This consequence increases prosperity for the entire nation and justifies federal involvement.[88] President Kennedy's predictions about the economic impact of the Greers Ferry project were evident even as he spoke.

As soon as construction started on the dam, hundreds of workers arrived in Heber Springs. By early spring 1960 residents parked trailers on nearly every vacant lot and in the yards of some private homes. Newcomers rented all unoccupied houses. Builders were rushing new houses to completion. The Cleburne County Bank expedited a $50,000 expansion program, and a new bank, the Arkansas National Bank, broke ground. Main Street looked like a frontier boom town. New stores, motels, and

ILLUSTRATION 100. President John F. Kennedy dedicating Greers Ferry Dam. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

restaurants strained the available utilities. Local farmers felt the effect of the project as demand for agricultural produce, livestock, and poultry increased. Twenty-two dairies and several milking operations ran at maximum capacity.[89] The influx of construction and Corps personnel and their families surpassed manyfold the capacity of the old school system. Because the increased enrollment was due to a federal project, the federal government guaranteed 75 percent of the cost of constructing a new junior-senior high school.[90]

Once Greers Ferry Lake had filled, tourism boomed. New businesses catered to tourists, and older businesses expanded. Eden Isle, located on a hilly peninsula jutting out into Greers Ferry Lake, became one of the most important new developments. An exclusive, planned residential development, it is centered around a luxury resort and conference complex called the Red Apple Inn.

Two other dam and reservoir projects proposed by the Corps in 1937 as part of the White River Basin Flood Control Plan were controversial enough to cause their abandonment.[91] In addition to Norfork, Clearwater, and Greers Ferry, the Memphis District's 1937 plan called for dams and reservoirs at Lone Rock on the Buffalo River, at Water Valley on the Eleven Point River, and at Bell Foley on the Strawberry River. Congress authorized their construction in 1938.[92] Controversies over Lone Rock and Water Valley erupted even before those over Greers Ferry. As at Greers Ferry, the primary issues were environmental and recreational with economic consequences. Because it was at the center of controversies about such issues long before most of the Corps, the Little Rock District's responses to such crises and controversies became examples for other Districts. What it did right and wrong may have influenced Corps-wide reaction to environmental activism of the later 1960s and 1970s.

The early plan located Lone Rock Dam approximately a mile above the mouth of Buffalo River, just outside Mountain Home between the present sites of Bull Shoals and Norfork dams.[93] The project had almost unanimous support until 1958 when Bill Apple and Gus Albright, later opponents of the Greers Ferry plan, organized opposition to the Lone Rock project.[94] Opponents of the Lone Rock plan organized the Ozark Wilderness Waterways Club in Kansas City solely to block the dam.[95] As the controversy escalated, Neal Compton and John Houston emerged as opposition leaders. The power companies, particularly Arkansas Power and Light, helped underwrite them.[96] Opponents focused on the natural and scenic beauty of the unimproved Buffalo River. A "comparatively small but primitive and unusually majestic" untamed river, the Buffalo "plunges down from the top of the Ozark Mountains" in Newton County, Arkansas, flows through Searcy County, across a corner of Marion County, to the edge of Baxter County where it joins the White River. The "awe-inspiring beauty of the hurrying, sparkling waters" rushing through the ancient rock-ribbed river valley brought raves from writers and naturalists, including Supreme Court Justice and noted conservationist William O. Douglas, who took a float trip down the Buffalo in 1962 as a guest of the Ozark Wilderness Waterways Club.[97] Opponents of the dam stressed the economic potential from recreational use of the river by float trippers, campers, rafters, and white-water canoeists. Some contended that, in conjunction with the other kinds of water-based recreation offered by Bull Shoals and Norfork, development of the Buffalo River as a scenic and wilderness-oriented recreational water resource would maximize tourism. They emphasized that the variety of experiences provided by an undammed Buffalo River would attract more visitors than another dam and reservoir would.[98]

Local residents, particularly in the Marshall, Arkansas, area, disagreed vehemently with these ideas. The *Marshall Mountain Wave* became the primary outlet for pro-dam sentiment. The paper's editors and the local residents whose opinions they represented wanted the permanent residents and the types of enterprises that had been attracted by neighboring reservoir areas. In their opinion, campers, rafters, float trippers, and canoeists usually brought with them all their own supplies and left little behind except litter.[99]

In 1962, as a result of the continuing controversy, Congress authorized the Little Rock District to restudy the issue. In an attempt to reach a compromise, the District recommended in 1964 that the dam site be moved from Lone Rock to a new location about fifty miles upstream, near Gilbert, Arkansas. Under this plan the dam would have had a direct impact on only twenty-eight miles of the Buffalo River, leaving approximately fifty miles of river below the dam and all of it above the reservoir in a natural state. Float fishing would have been possible virtually the whole length of the river, while white-water, wilderness boating would have remained available in the most rugged areas of the stream's course.[100]

ILLUSTRATION 101. Cartoon by George Fisher. Reprinted with permission of the ***Arkansas Gazette****.*

While still unacceptable to the opponents of damming the Buffalo, the plan met with great approval from the proponents, who were delighted with the choice of Gilbert, a site closer to Marshall, Arkansas, rather than Lone Rock. In December 1965, however, Governor Orval Faubus informed the Corps of Engineers that he opposed the Gilbert Dam.[101] In March 1966 Chief of Engineers Lieutenant General William F. Cassidy announced the Corps would abide by the governor's wishes and withdraw its recommendation for construction of Gilbert Dam. So the Corps' previous recommendation favoring construction of the Lone Rock project and Congress' authorization of it remained.[102]

In 1967 John Paul Hammerschmidt defeated Jim Trimble in the local congressional election. Representative Trimble long supported damming the Buffalo River and vowed to fight for it as long as he held public office. His defeat removed virtually all effective political support for the project. Representative Hammerschmidt almost immediately introduced legislation calling for the Buffalo River's inclusion in a new Ozark National Park.[103]

Although the Wild and Scenic Rivers Act of 1968 authorized Corps preservation of relatively unspoiled and undeveloped waterways such as the Buffalo, it did not include the Buffalo River as one of the country's first national scenic rivers.[104] It was not until early spring 1970 that the Senate gave the Buffalo River national scenic river status, and in 1971 Colonel William C. Burns, Little Rock District Engineer, announced that the Corps formally and officially supported wild and scenic river status for the Buffalo.[105] Designated areas along the river finally achieved national park status in 1977. In a separate action in September 1977, Congress deauthorized the Lone Rock project.[106]

Congress simultaneously deauthorized the Water Valley dam and reservoir project on the Eleven Point River, a tributary of the Spring. The reservoir would have been located east of Norfork, Bull Shoals, and Table Rock and northeast of Greers Ferry. Although the local controversy is not as well documented, the Water Valley project evolved much like the Lone Rock project, escalating until Water Valley citizens threatened Little Rock District Engineer Colonel Charles Maynard's life for agreeing to appear at public hearings conducted by the District during its reevaluation of the Water Valley project. These threats were serious enough that the Corps requested the Secret Service and the Federal Bureau of Investigation to protect Colonel Maynard. The District did not seek a compromise, as it had at Buffalo, by proposing a different location on the Eleven Point for a dam; rather, in 1965 it deferred the project. In 1968 Congress included the Missouri reach of the Eleven Point River in the original Wild and Scenic Rivers Act.[107]

The third as yet unbuilt White River basin dam and reservoir project Congress authorized in 1938 is the Bell Foley project on the Strawberry River, a tributary of the Black. This project's location was also toward the northeastern edge of the Ozark highlands of Arkansas, east of Norfork, Bull Shoals, and Table Rock and northeast of Greers Ferry, but southwest of Clearwater. Eventually, preconstruction planning occurred in July 1970, but the Corps placed the project on inactive status in June 1977.[108] As of 1985, its future was unknown.

The Reservoir Program Is Completed

Although controversies originating in the 1950s prevented completion of some planned dams and reservoirs, Congress authorized a new dam and reservoir project during that period. The Little Rock District began officially to discuss such a project on the White River between Eureka Springs and Rogers, Arkansas, as early as 1945, but Congress did not authorize construction until 1954.[109] The Little Rock District broke ground for the Beaver Dam project in October 1959, and work commenced in November 1960. The District completed Beaver Dam in May 1965 when the two hydroelectric generating units in the powerhouse went on-line. The Little Rock District's cumulative experience in constructing hydroelectric power plants resulted in an especially well-designed dam and plant. The plant incorporated advanced technology that minimized staffing needs: the Beaver powerhouse is

ILLUSTRATION 102. First bucket of concrete being poured at Beaver Dam on 6 November 1961.

(Courtesy of Jesse W. Story)

operated by remote control from the Table Rock powerhouse and delivers about 200 million kilowatt-hours annually to the Southwestern Power Administration.[110]

The dam's design links it to Table Rock. Like Table Rock, it is a concrete and earth embankment structure. It is slightly shorter than Table Rock, with a maximum height of 238 feet compared to Table Rock's 252 feet. At 2,575 feet long, Beaver is only about one-third as long as Table Rock. Nearly half of Beaver's length consists, however, of its concrete-gravity section.[111] By the time the Little Rock District built Beaver Dam the work was fairly routine and the staff could make light of itself and the process. For example, J.B. Holloway, an engineer employed by the District, penned the following satirical poem on the Beaver Dam design process:

The Saga of the Beaver Berm

Now, this is the tale of the Beaver Berm
At mention of which the experts squirm,
And faces take on various hues
From reds to greens and pastel blues.

The Beaver Dam was well designed,
The specs approved and the drawings signed,
And all that remained to be done otherwise
Was to figure the cost and advertise.

The dilemma arose quite innocently
Because of a guessed-at quantity
Of earth, which requiring removal, still
Was deemed unsuitable for making fill.

The engineer to whom was assigned
The task of searching and trying to find
The most logical method for use of the soil
Was hard put to locate a place for this spoil.

He studied the site plan diligently,
And avidly scanned the topography
Until, quite by chance, he happened to see
The ideal spot (or it seemed to be).

'Twas a natural depression, long and deep,
With a sharp V-bottom and side slopes steep;
A beautiful gully as gullies go,
Located adjacent the upstream toe.

He measured its volume with utmost care
To insure that adequate space was there
To hold the waste which he guessed to be
Fifty thousand yards, approximately;

And finding it adequate, beamed with joy,
And thought of himself as a brilliant boy.
Then taking a pencil, he scribed its bound
Upon the plan, the perimeter 'round;

And within the area he'd thus planned,
He wrote "SPOIL BANK" in bold free-hand;
And naively thinking his job was through,
Submitted his findings for review.

Now, the first reviewer had great insight,
And said to himself: "'Tis not just right
To say 'SPOIL BANK' because I see
The spoil will add some stability

To help support the upstream slope,
Increasing the factor of safety (I hope)";
And thinking to use a more suitable term,
He changed "SPOIL BANK" to read "SPOIL BERM."

The second reviewer reasoned thus:
"The term 'SPOIL' seems superfluous.
The wording on drawings should be short and firm."
He deleted "SPOIL," and left it "BERM."

The drawings were sent to authority high,
And passed under many a critical eye;
Where much was discussed, and little was done;
And practically nothing decided upon,

Until one great expert gave note to the fact
That the plans did not show just precise and exact,
Nor yet did the specifications affirm
The nature of soil to be used in the berm.

Quoth he: "I've discovered an error. Me thinks
This work that is done by these peasants, it stinks.
A comment is called for, and comment I will."
And he wrote: "Build the berm out of previous fill."

Now, no one could question this man of renown
Because he resided in Washington Town,
And hence, was an expert in regard to all
Of matters quite great, and of matters quite small.

And mind you, the borrow for previous fill
Required a mile's haul over mountain and hill;
And consequently, as you might guess,
Was priced at a dollar per yard, no less;

So fifty thousand Iron Men
Which could have been spent (and should have been)
For some useful purpose were therefore retired
To build a berm which was never required.

But consider the plight of the poor dumb cluck
Who started the whole mess, and now cursed his luck;
For in spite of this useless waste of good soil,
He's still no place to put the spoil.

The District, of course, resolved the hapless engineer's spoil problem and completed Beaver Dam in 1962. Beaver Lake, slightly smaller than Table Rock in terms of surface area, has a shoreline only half as long. Its surface area is about 31,700 acres and its shoreline about 480 miles. The Little Rock District estimated that between 1962 and 1985 Beaver Lake prevented $14,760,000 in flood damages.[112]

As early as 1965 it was clear that development at Beaver would be different than that at Table Rock. Beaver did not become a summer resort and recreation center; it almost immediately became known as a residential lake with occasional resorts. The direction this development took was probably, as at Table Rock and Greers Ferry, based on the Corps' new land acquisition policy that permitted private development along the lakeshore and on

the kind of development that existed before the dam was built. Cooper Communities, a planned retirement home development, preceded Beaver Lake in the area. Cooper Communities developers had created their own small lakes within the housing areas.[113]

Beaver Lake is unusual in another regard. The Little Rock District pioneered new uses for its reservoir storage. The Beaver water district pipes high-quality water taken from the lake to such diverse communities as Fayetteville, Springdale, Rogers, Bentonville, and other smaller, more remote towns in the vicinity. The Little Rock District contracted to provide water from the lake to all the communities in the District requesting it. This new use of the District's reservoirs spread quickly, for nearly all contain high-quality water.

The availability of this water promoted the residential development characteristic of the region. In 1969 the District reallocated some water stored for hydroelectric power at Norfork to water supply. It did the same at Greers Ferry in April 1971. Blue Mountain supplies water for Plainview, Arkansas. Also, Dardanelle Lake on the Arkansas River and Dierks, Gillham, DeQueen, and Millwood lakes in the Little River Basin serve as water supplies.[114]

Although people believed they knew the economic potential of a Corps reservoir by the time Beaver was built, they had yet to experience the cumulative effect of the Little Rock District's concentration of reservoirs in north-central Arkansas and southern Missouri. The influx of retirees and other newcomers has made Arkansas second only to Florida in terms of the average age of its residents. This is attributable not to an outward migration of the young, but to the immigration of retirees from other parts of the Midwest. The Little Rock District's activity since 1937 has in fact helped stem the outward migration of young people. Population growth not only has meant increased wealth in Arkansas and Missouri, a boom in real estate and construction, and the development of new service businesses, but it also has changed the politics of the states. Many of these relatively wealthy Yankee newcomers are Republicans. For the first time since Reconstruction, the Republican party has strong, viable support in Arkansas. The return of the two-party system to Arkansas has contributed in part to a turnover in the congressional delegation, which has lessened its power by diminishing its seniority. However, this change means that the state has advocates in Washington regardless of which party controls Congress or is in the White House.[115]

The socioeconomic structure and the politics of Arkansas and Missouri have been irrevocably altered since completion of these Little Rock District projects. Also during this period, another District project, the McClellan-Kerr Arkansas River Navigation System, brought significant changes to the area.

Chapter VIII

Renaissance of the River, 1945-1971

As the Army Corps of Engineers moved in the direction of comprehensive river basin development in the 1930s, a major multipurpose project took shape in the Little Rock District. The Arkansas region, with the Little Rock District rejuvenated by reservoir construction, soon became the focus of a multipurpose project, the McClellan-Kerr Arkansas River Navigation System. This, the largest Corps project to that date, began at the end of World War II.

The project represented a significant departure from Corps approaches and methodology used to improve the Arkansas River to that date. This project was different because it utilized slack-water navigation. It was a project of such scale to change the face of the river totally and was meant to serve multiple purposes. The Corps had used slack-water navigation on the White River at the turn of the century, but it did not see the approach as feasible on the Arkansas until midcentury. To be successful, the method required a major transformation of the river, a reconstruction using an approach pioneered by the Corps on the Ohio River in the 1930s. By the time the Arkansas River project was planned, complete transformation of a waterway was an almost routine Corps approach to comprehensive water resource development. The Little Rock District exemplified contemporary Corps thinking in its multipurpose approach. Not only was the project to make river traffic feasible once again, it was also intended to limit flooding, produce hydroelectric power, and provide recreational opportunities.

Less than a month after V-J Day the Corps of Engineers' national Board of Engineers for Rivers and Harbors (BERH) considered the merits of the Arkansas River Survey Board's plan for a multipurpose improvement project for the Arkansas and its tributaries.[1] The Chief of Engineers had established BERH in 1902 to review prospective Corps projects independent of local political influence. The board approved only projects its members, acting as professional engineers and not as administrators, judged meritorious.[2] In its 1945 report to the Chief of Engineers, BERH stated that it was not convinced that navigation benefits of the proposed Arkansas River basin multipurpose project warranted construction.[3] Based on a seven to zero vote, the board suggested deferral of the navigation features of the project. Such action would have restricted Arkansas River basin improvement to the flood control reservoirs already authorized by the Flood Control Acts of 1936 and 1938, plus four more flood control reservoirs and the addition of dams in the Grand (Neosho) River basin. The Corps justified the Grand River basin dams primarily because of their hydroelectric power generation capability. Portions of the plan BERH approved also added power-generating facilities to the main-stem dams remaining in the overall project.[4]

Eugene Reybold, now a lieutenant general and the Chief of Engineers, received this report. In an unusual move, he overrode the board's recommendation.[5] In a 20 September 1945 letter to the Secretary of War, he explained that the navigation features were a principal part of the Arkansas River multipurpose plan and that he was convinced their construction was "fully warranted and should be authorized at this time." He further stated that it was reasonably certain that the tonnage for the improved Arkansas River would exceed the amount the Corps estimated, based on preimprovement conditions in the basin. The Corps had made virtually no allowance for industrial growth and natural resource development.[6]

The Secretary of War accepted General Reybold's recommendation to overturn BERH's recommendation. Consequently, the Chief of Engineers' report to Congress recommended construction of the proposed Arkansas River multipurpose project, including its navigation improvement features. This allowed the House Rivers and Harbors Committee to include the project in its annual rivers and harbors bill. Since 1907 this committee had a policy of not considering any project for inclusion in the annual bill unless it had the approval of the Corps of Engineers.[7]

On 8 and 9 May 1946, under the joint chairmanship of Representatives Hugh Peterson of Georgia and John E. Rankin of Mississippi, the House Rivers and Harbors Committee held hearings on the Arkansas River multipurpose project as developed by the Arkansas River Survey Board and as submitted to Congress in 1945. The project's purposes were navigation, hydroelectric power, flood control, and recreation. N.R. "Newt" Graham, of the Tulsa Clearing House Association, and David D. Terry, director of the Division of Flood Control and Water and Soil Conservation of the Arkansas Resources and Development Commission and a former member of Congress, directed the testimony in favor of the project. Representative Oren Harris led the Arkansas delegation; Governor Robert S. Kerr of Oklahoma and Governor Ben T. Laney and Senator J. William Fulbright of Arkansas made statements and participated in the

questioning. R.P. Hart of the Association of American Railroads presented the principal opposition testimony.[8] The standard railroad position remained unchanged since the 1890s: railroads could transport anything waterways could, and the capital investment to build a railroad was considerably less than that required to build a waterway.

The plan debated before this committee called for a nine-foot-deep navigation channel from the Mississippi River to Catoosa, Oklahoma. The Corps planned this channel to follow the White River upstream from the Mississippi River for ten miles; then it would cut over to the main stem of the Arkansas River by way of a man-made canal. From the junction of the canal and the Arkansas, the channel would follow the main stem of the Arkansas to the confluence of the Arkansas and Verdigris rivers in Oklahoma. The Arkansas River Survey Board planned the channel to continue approximately fifty miles to Catoosa via the Verdigris.

The plan took navigation to Catoosa, a city now a suburb of Tulsa, rather than to Tulsa proper because Catoosa is ninety-one feet lower than Tulsa. Only three locks and dams would be needed on the Verdigris to get to Catoosa; eleven would have been needed to get to Tulsa. Since a lock and dam was estimated to cost about $20 million, by eliminating eight additional locks and dams the Arkansas River Survey Board reduced the cost of the improvements by about $160 million.[9]

Even with this reduction in the number of structures planned, the 1945 version of the Arkansas River navigation project called for twenty-seven sets of locks and dams compared to seventeen in the final plan. The plan proposed utilizing five reservoirs previously authorized as part of the general comprehensive plan for the Arkansas River basin. It incorporated Mannford, Markham Ferry, and Fort Gibson reservoirs as then planned, and it enlarged versions of Oologah and Tenkiller Ferry. In addition, the plan called for construction of seven additional upstream reservoirs: Blackburn, Taft, Eufaula, Webbers Falls, Short Mountain (Robert S. Kerr), Ozark, and Dardanelle. Locks and dams on the navigation channel were to form Webbers Falls, Short Mountain, Ozark, and Dardanelle. Eufaula would primarily serve as flood control, while the other six would primarily benefit navigation.[10]

Before construction of any of these features, however, the plan called for completion of three studies. Before General Reybold overrode the BERH's recommendations in 1945, he instructed the Corps to study further the exact location and route of the man-made canal from the White River to the Arkansas. The 1945 plan requested congressional permission for the Corps to complete studying all options, which ranged from carrying the channel far enough up the White to connect with the Arkansas at Little Rock to making the channel so short that the canal would join the Arkansas below Arkansas Post. Only after engineers had completed these studies would the Corps make its final recommendation on the location and route of the canal between the White and Arkansas rivers.[11]

Even before Reybold's review the Arkansas River Survey Board recommended the Corps study further the sedimentation problems. The major engineering difficulty was the unusually large amount of sediment carried by the river. In the 1940s, when this plan was being developed, about thirty-three thousand tons of sediment flowed past Little Rock in an average twenty-four-hour period. Such a volume would clog a navigation channel and create problems in operating machinery. The 1945 plan recognized that silt-trap dams were required. Sediment dropping from water detained in reservoirs behind dams would lead to the eventual filling of the silt-trap reservoirs, but while the traps functioned the Corps expected them to reduce by 80 percent the sediment in the remaining portions of the river. Most of the sediment came into the Arkansas in Oklahoma. The Canadian, North Canadian, and Cimarron rivers carried the most silt, but the Verdigris, Deep Fork, Poteau, and Illinois also added to the Arkansas' sediment load. Therefore, the silt-trap dams would have to be located in Oklahoma near these tributaries. The board believed the Corps needed time to refine the details of these upstream solutions to the silt problem before it began construction of the major downstream portions of the project.[12]

Finally, the Federal Power Commission was to study further hydroelectric power development in the Arkansas River basin. The commission wanted to consider adding dams in the Grand River basin, substituting Keystone for Mannford and Blackburn, and adding power-generating facilities at the dams on the main stem of the Arkansas.[13]

Including the cost of these additional studies, the Corps estimated the total cost of the project at $524 million. Projects previously approved accounted for $77 million of this total. The cost-benefit ratio was 1.08 to 1, with 75 percent of the benefits attributed to navigation, 21 to power generation, and 4 to flood control.[14] Interestingly enough, although Congress made recreation an official project purpose, it had not authorized the Corps to use recreation in its official cost-benefit analysis.[15]

The project advanced on 13 May 1946 when the House Rivers and Harbors Committee passed its annual rivers and harbors bill authorizing construction of the Arkansas River multipurpose plan as outlined by the Arkansas River Survey Board in 1945. It provided for the additional studies requested by the Corps and the Federal Power Commission and for the amendment of the plan to reflect the results of their studies. The bill, however, authorized only $55 million for planning and construction of Eufaula Reservoir.[16]

When the bill reached the full House for debate in June 1946 Representative A.S. "Mike" Monroney of western Oklahoma, with the support of Representative George A. Dondero of Michigan, tried to have the Arkansas River project deleted from the bill. Monroney emphasized the marginal cost-benefit ratio and BERH's opposition to the navigation features of the project. Representatives Hugh Peterson, William G. Stigler, Brooks Hays, Oren Harris, Mike Mansfield, John Rankin, Fadjo Cravens, and William F. Norrell opposed the deletion. When Monroney's amendment came up for a vote it was defeated 42 to 99. Thus, when the rivers and harbors bill for 1946 passed the House, it included the authorization and a limited appropriation for the Arkansas River multipurpose project.[17]

Four days later, on 10 June 1946, the Senate Commerce Committee began hearings on the bill as drafted by the House Rivers and Harbors Committee. Senator John H. Overton of Louisiana chaired that portion of the hearings dealing with the Arkansas River project. Senators John McClellan of Arkansas and Edward Robertson of Wyoming actively participated in the questioning. Governor Kerr of Oklahoma, H.K. Thatcher of the Arkansas Resource and Development Commission, and J.C. Murray of the Little Rock Chamber of Commerce testified in favor of the project. R.P. Hart of the American Association of Railroads again testified in opposition to the bill.[18]

As passed by the Senate Committee, the annual rivers and harbors bill included the same Arkansas River project with the same provisos as the House version. However, it included a $150 million rather than a $55 million appropriation. The increased appropriation allowed work on the navigation channel from Little Rock to the Mississippi in addition to the work on the Eufaula Reservoir.

Senate floor discussion did not deal with the project itself. Rather, it questioned whether the provision that navigation

ILLUSTRATION 103. Senator John L. McClellan. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 104. Senator Robert S. Kerr. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

projects shall not interfere with irrigation projects in the western states applied to the Arkansas River project. On 5 July 1946 the House bill as amended in the Senate committee passed the Senate.

During the resulting conference the House conferees agreed to all the changes the Senate committee had made in the bill, including the increased funding. But when the conference report reached the floor of the House on 9 July 1946, at the instigation of Representative Dondero and with the support of Representatives Monroney and Robert T. Rich of Pennsylvania, members, by a vote of 159 to 123, recommitted the bill to the Senate with the provision for an appropriation of $55 million rather than $150 million for the Arkansas River project. When the conference report and the House provision on the reduced appropriation reached the Senate, the Senate acceded to the House's wishes, despite the objections of Senator McClellan. On 24 July 1946 President Truman signed the annual Rivers and Harbors Act into law.

As Emmett Sanders, a prominent local supporter of the improvement, later recalled, the river improvement boosters exalted in this action. They considered their battle won and thought construction would begin immediately. Only later did they learn of the difference between authorized and appropriated, and that this difference was crucial. It took about ten years of persistent effort before the Corps began construction, and even longer before work commenced in the Little Rock District reach of the waterway.[19] Initially, the fact that appropriations were not forthcoming can be accounted for in part by the immediate postwar period of "reconversion" when President Truman placed less importance on recovery measures involving waterway development than on measures involving private industry.

Early in the postwar period forces threatened the Corps of Engineers with the loss of its civil works mission. Although this threat was less serious than the one in the 1920s and 1930s, it was reminiscent of the earlier battle. In 1945 President Truman asked Congress for a reorganization act to include all parts of the government. Congress provided the act but specified that the Corps of Engineers not be considered for reorganization.[20] In 1947 Truman appointed former President Herbert Hoover chairman of a commission for reorganization of the executive branch. Hoover's 1949 report called for the transfer of control of harbor and flood work from the Corps of Engineers to the Interior Department. At first the staff of the Corps of Engineers were confident that the President would not give the Hoover recommendations to Congress, but in the early 1950s Truman did just that.[21]

As a result, criticism of the Corps and its management of water resource projects became more public than at any time since the 1930s. In 1951 the House Public Works Committee created a special subcommittee to examine federal water project policies and procedures. The subcommittee found Congress had authorized more than nine hundred projects that the Corps had not yet begun. The Public Works Committee insisted that the Corps systematically work through this backlog. The committee ordered the Corps to review all civil works projects and classify each as active, inactive, or deferred for further study. In 1952 the Corps began this review and categorization process.[22]

Meanwhile, the Corps began to counterattack the Truman reorganization plan and the Hoover report. It called its offensive Operation Pork Barrel, which proved successful although it lasted into the Eisenhower era.[23]

This sequence of events, when considered in conjunction with the simultaneous outbreak of the Korean War, helps explain why Congress did not appropriate money for the improvement of the Arkansas River as quickly as its boosters might have liked.

However, even after attempts to transfer civil works from the Corps had ended, appropriations for the Arkansas River multipurpose project did not come easily.

In 1948 Congress began tinkering with the Arkansas River improvement project plan authorized in 1946. While some alterations to the plan appear to have been politically motivated, others were responses to engineering findings. In 1948 Congress added to the project bank protection at Bradens Bend, Oklahoma, and authorized $1 million for the work. Simultaneously, it modified the irrigation storage provisions relating to Canton Reservoir.[24] In 1950 Congress modified the 1938 General Comprehensive Arkansas River Basin Flood Control Plan and the 1946 multipurpose plan. By the terms of the Flood Control Act of 1950, the Corps substituted Keystone Reservoir for Mannford Reservoir in the 1938 plan and deleted Blackburn and Taft reservoirs from the 1946 plan. The Corps determined that Eufaula Reservoir on the Canadian River and the new Keystone Reservoir where the Cimarron joined the Arkansas should serve as the silt-trap dams necessary to ensure the project's success. Congress appropriated $37.3 million to effect these changes and an additional $15 million to implement the 1938 flood control plan. Congress also authorized construction of Optima Reservoir as authorized in 1936 but ordered it be operated to allow maximum conservation storage in Canton Reservoir.[25]

Then, in the Rivers and Harbors Act of 1950, Congress for the first time authorized appropriations for navigation features of the Arkansas River Multiple-Purpose Plan of 1946. Apparently, BERH's recommendation that the navigation portions of the plan not be constructed influenced congressional action for a number of years. The money Congress authorized in 1946 was for Eufaula Reservoir, a flood control feature of the plan that would now serve a silt control function. The money authorized in 1948 was for bank protection in Oklahoma. The money authorized in the Flood Control Act of 1950 related exclusively to flood control features of the improvement.[26]

In 1950, at hearings before the House Public Works Committee, the Corps of Engineers requested an additional $427 million to fund the Little Rock District's six-year program on the General Comprehensive Arkansas River Basin Flood Control Plan of 1938 and the Arkansas River Multiple-Purpose Plan of 1946. The District planned that $250 million be used for navigation works. The House agreed to authorize $70 million to implement the multipurpose plan, and the Senate agreed to authorize $89 million. (The Senate intended the Corps to use the extra amount for additional bank stabilization.)The conference report settlement authorized $80 million including $30 million for bank stabilization.[27] Although the 1950 Congress gave the Little Rock District less than 20 percent of the money requested and designated over 30 percent of that for a specific task, much effort was required to secure even this.

It is not coincidental that 1950 was also the year in which President Truman created the first Arkansas-White-Red Basins Interagency Committee (AWRBIAC). In the Flood Control Act of 1950 Congress for the first time instructed several federal departments, agencies, and commissions to make cooperatively and simultaneously the broadest possible investigations and to prepare comprehensive and integrated plans for developing water and related land resources in a group of river basins. Congress ordered the Secretary of the Army to have the Chief of Engineers direct preliminary examinations and surveys of potential flood control measures for the three river basins. The Flood Control Act of 1950 also charged the Secretary of Agriculture to examine and survey runoff, water flow retardation, and soil erosion prevention in the basins. In addition, Congress directed the Departments of Labor, Commerce, and the Interior; the Federal Power Commission; the Federal Security Agency; and the Public Health Service to participate in the study. Congress expected the study would affect all of the areas under the jurisdiction of these federal government organizations, so it invited governors of the eight states included in the three river basins to participate in the study.[28]

Soon after the passage of the act, President Truman instructed these federal agencies to organize a committee and designated the Department of the Army as the chair agency. Thus the Chief of Engineers became responsible for the final report. Chief of Engineers Lieutenant General Lewis A. Pick delegated preparation of the report to the Southwestern Division.[29]

Colonel Lewis W. Prentiss, Division Engineer, insisted that the final report be a "COE report and not an Inter-agency report." He ordered the Little Rock, Tulsa, Albuquerque, New Orleans, Vicksburg, and Memphis District staffs to ensure that the Corps control and dominate the study. Colonel Prentiss, however, cautioned the group not to alienate the other federal agencies involved.[30]

This task proved difficult. While AWRBIAC began work, conflict between its members arose, the most serious occurring between the Corps and the Department of Agriculture's Soil Conservation Service (SCS). Staffs of the two agencies held opposing views on how best to control floods. By 1950 the Corps' commitment to using upstream reservoirs to control floods was as intense as its opposition had been in 1938. The SCS's commitment was to using smaller flood control structures in a river's far upper reaches.[31]

By 1952 Prentiss had another assignment and Brigadier General Herbert D. Vogel was Division Engineer and chairman of AWRBIAC. During Vogel's tenure disagreement between the Corps and the SCS led to a journalistic furor. Elmer Peterson, editorial writer for the Oklahoma City *Daily Oklahoman*, wrote an article entitled "Big Dam Foolishness" which *Country Gentleman* published in May 1952. The article compared Tulsa District and SCS flood control measures on the Washita River in Oklahoma. Peterson argued that the Tulsa District's reservoirs worsened floods and concluded that the SCS's small, far upstream structures were superior. The issue received much publicity from Peterson's article, and the Corps was roundly criticized.[32]

The House of Representatives Subcommittee on Civil Works asked the Chief of Engineers to respond to Peterson's charges. The Corps questioned the reliability of Peterson's data and asserted that Peterson compared data that were not comparable. The Corps also explained that while the two agencies disagreed over flood control strategies, each agency's method was ideally intended to complement the other's. The Corps pointed out the supplemental benefits large reservoirs provided in terms of recreation, irrigation, and municipal-industrial water supply.[33]

Although no further action came from Peterson's article, the internal friction it publicized delayed AWRBIAC's report. Congress and the President expected the study in two years; it took four.[34] Progress began only after the Secretaries of the Army, the Interior, and Agriculture issued a memorandum of understanding in September 1953 that redefined the objectives of the AWRBIAC and established a procedure for the committee to use for resolving differences among its members. The secretaries also recommended that President Dwight D. Eisenhower appoint an impartial adviser to the committee. In March 1954 Eisenhower approved the memorandum and appointed Walter L. Huber adviser.[35]

With what one historian called a "sense of rejuvenation," the committee resumed work and finally filed a report in June 1955. As described in its preface, this report was a framework for Congress to use to guide any federally supported development of the Arkansas, White, and Red river basins. AWRBIAC did not intend the report to serve as the basis for authorization of any project. The report did, however, explain those points upon which the federal and state units involved in the first AWRBIAC had reached consensus.[36]

Meanwhile, even before AWRBIAC completed its report the Federal Interagency River Basin Committee (FIRBC), the parent agency of AWRBIAC, created a new AWRBIAC. FIRBC organized the new AWRBIAC and the other similar committees it developed quite differently from the original AWRBIAC. Various individuals served as chairmen of the new committee, and the agencies limited their participation because they received no additional personnel and funding for their contributions. The second AWRBIAC also had more limited goals than the first. It was essentially a coordinating and fact-finding committee concerned with only certain aspects of basin planning. The second AWRBIAC did, however, maintain a friendly cooperative atmosphere among its members and encouraged the exchange of information.[37]

The second AWRBIAC served as a valuable ally to the nongovernmental lobbyists in groups such as the Arkansas Basin Association. Having the first AWRBIAC report detailing the points of consensus among federal and state members was critically important to the Arkansas River improvement boosters. Their success had been limited since Congress limited their appropriations in 1946, 1948, and 1950. Despite President Truman's declaration in January 1952 that multipurpose improvement of the Arkansas River was "necessary to the national defense," Brigadier General Claude H. Chorpening, Assistant Chief of Engineers for Civil Works, classified the Arkansas River multipurpose project in 1954 as deferred for further study.[38]

Reacting to this, the Little Rock District, with other Division staff, reexamined the project, and the Corps raised its benefit-to-cost ratio.[39] In December 1954 Southwestern Division Engineer Brigadier General Lyle E. Seeman recommended to the Chief of Engineers that the project be reinstated in the active category "due to its comprehensive nature and its relation to other individually authorized projects and in view of the interest of Arkansas and Oklahoma leaders."[40] In 1955 Chief of Engineers Lieutenant General Samuel D. Sturgis recommended to the Public Works Committee and the director of the Bureau of the Budget that the Arkansas River project be reactivated. He recommended that bank stabilization begin immediately and that the Corps complete the Oologah Reservoir begun in 1950.[41]

In 1956 Congress enacted appropriations for construction of the Arkansas River Multiple-Purpose Project.[42] This funding included $3 million for the completion of Oologah Reservoir, $450,000 for construction of Eufaula Dam, and $450,000 for construction of Dardanelle Lock and Dam. But this success was short lived. The Bureau of the Budget approved release of the funds to complete Oologah but refused to release funds for Eufaula and Dardanelle. Without funds to construct Keystone and Eufaula, the silt-trap reservoirs, Corps concern about engineering problems associated with silt reemerged. The Chief of Engineers withheld approval for the entire project pending resolution of these engineering problems. The Corps reclassified the Arkansas River multipurpose project as inactive.[43] President Eisenhower impounded the funds appropriated for Eufaula and Dardanelle, explaining that beginning construction would

> commit the Federal Government to a cost of over one billion dollars for the development of the Arkansas River for navigation, since the major benefits from these two structures would not be realized until the entire navigation development is completed. I regard the development of the Arkansas River for navigation as not being of sufficiently high priority at this time to justify this large financial commitment.[44]

The Arkansas River boosters and Congress persevered in spite of this setback. In 1956 the Senate Public Works Committee, chaired by Oklahoma Senator Robert S. Kerr, began considering the Interstate Highway System as a public works project. This proposed project had wide-ranging benefits and national appeal. Kerr promised to push the highway program through the Senate in return for votes for the Arkansas waterway. In 1956 Congress passed a federal aid to highways act providing for a 41,000-mile continuous four-lane road connecting 209 cities in 48 contiguous states. The government estimated its cost at approximately $27.5 billion, 90 percent funded by the federal government.[45] That same year Congress passed the 1957 Public Works Appropriation. It included $650,000 for Dardanelle, $1.25 million for Eufaula, and $1.5 million for Keystone Dam and Reservoir.[46] Congress passed these appropriations even though the congressional appropriations committees had not taken any action, the Bureau of the Budget had not recommended them, and the Office of the Chief of Engineers still classified the projects as inactive. As one historian explained it, "Further questions by the Chief of Engineers on engineering or costs were useless; Congress had declared its intention to build the waterway, and the Corps of Engineers had to comply."[47] Project work finally began.

The Corps began by attacking the still-unresolved engineering problems associated with the heavy sediment load carried by the Arkansas. As the chief of the Office of the Chief of Engineer's Engineering Section told the new Southwestern Division Engineer, "Don't let anybody tell you that the basic engineering for this project has been worked out. It has not and that will be your first priority in Dallas. The existing plans can not be relied upon."[48]

From an engineering view, the 190-mile section of the waterway within the Little Rock District presented the problem. No major tributaries enter the Arkansas between Little Rock and Arkansas Post. The slope in this reach of river averaged only eight-tenths of a foot per mile. Variations in slope were local while flood flows were uniform. The main stem of the river itself was alluvial here; it flowed over beds of its own sediment.[49]

The engineers studying the sediment problem decided that if the Corps contracted the upper end of each navigation pool, the river channel would maintain a greater depth. This would help control the main stem. The engineers also suggested that the Corps build stabilization works along the main stem. They recommended using training dikes—that is, lines of rock and timbers extending into the river perpendicularly to the bank. Finally, engineers studying the sediment problem suggested the Corps build rock revetments along the banks parallel to the flow. These measures would confine the channel to its prescribed route and help the river cleanse itself of sediment.[50]

The Waterways Experiment Station at Vicksburg, Mississippi, built a general model to test these measures. They worked. Implementing them allowed the Corps to eliminate three proposed dams from the plans.[51]

In 1960 Congress authorized the Little Rock District to combine the General Comprehensive Arkansas River Basin Flood Control Plan of 1938 with the Arkansas River Multiple-Purpose Plan of 1946.[52] The combined Arkansas River basin project, the

largest project the Corps of Engineers had ever undertaken, consists of twelve locks and dams in Arkansas, five locks and dams in Oklahoma, two upstream reservoirs in Arkansas (Nimrod and Blue Mountain), and seven upstream reservoirs in Oklahoma (Keystone, Oologah, Eufaula, Tenkiller Ferry, Pensacola, Markham Ferry, and Fort Gibson). It provides flood control, power generation, water storage, recreation, and a year-round navigation channel with a minimum depth of nine feet extending 450 miles from the Mississippi River to the greater Tulsa metropolitan area. The lock and dam system provides a total lift of 420 feet enroute upstream. The lifts at individual locks and dams range from 14 feet to 54 feet.[53]

As of 1960 the Arkansas River basin improvements were located in several Corps of Engineers Districts, but in 1961 the Corps began to simplify administration of this project. It relieved the Vicksburg District of its responsibilities for work downstream from Pine Bluff, Arkansas. The Southwestern Division reassigned those tasks to the Little Rock District. The Division made the Tulsa District responsible for design of all locks in the system and the Little Rock District responsible for design of all dams.[54]

The Little Rock District managed some of the most innovative work because it performed all the pile testing for the project, the largest pile-testing program in the world at the time. It tested concrete, steel, and timber piles. Five of the first six locks and dams in the Arkansas system are sited on sand and require piling for support. (Lock and Dam Number 5 is sited on clay, so the District did not need to use piling because of the stability of the subsoil. All other structures in the system have rock foundations.)The District developed many new piling methods and procedures in designing the five structures supported by piles driven in sand. It conducted its most significant tests at lock and dam sites numbers 3 and 4.[55]

The Tulsa District superintended construction work west of Fort Smith, Arkansas, while the Little Rock District superintended construction to its east. The Tulsa District oversaw the first project construction beginning in 1956. Construction on Eufaula and Keystone dams and reservoirs had to be begun first because these two silt-trap structures had to be virtually complete before lock and dam construction could commence. The Corps intended Eufaula and Keystone to reduce sediment in the rest of the Arkansas River by 80 percent, which would allow the machinery and locks to function.[56]

In 1957 the Little Rock District began construction planning for Dardanelle Lock and Dam, the first structural work involved in the navigation aspect of the project. It broke ground for the Dardanelle structures in 1959, although the flood of 1959 delayed construction and the lack of adequate appropriations held up the start of construction on the other lock and dam complexes.[57] With the advent of the New Frontier program of the Kennedy administration, the Arkansas congressional delegation found funds to complete the entire project.[58] President Kennedy's budgets gave more river jobs to Arkansas than to any other state.[59] Under the New Frontier, a new approach toward civil works came to the fore. The administration focused national attention on clearly identifiable economically distressed areas. Harking back to the TVA initiatives of the New Deal, the federal government developed and applied comprehensive regional programs of public works in efforts to revitalize the economies of these regions. New Frontier initiatives such as the 1961 Area Development Administration and the Appalachian Development Act of 1965 differed from their New Deal predecessors.[60] Congress and the administration made the 1960s programs more encompassing than the 1930s projects. New Frontier regional development programs could involve construction of all kinds of public works, whereas New Deal planners had restricted projects such as the TVA to specific benefits from waterway development.

ILLUSTRATION 105. Ground breaking for Dardanelle Lock and Dam, 12 June 1959.
Left to right: Senator John McClellan, Congressman Brooks Hays, Major General Emerson Itschner and Senator J. William Fulbright.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

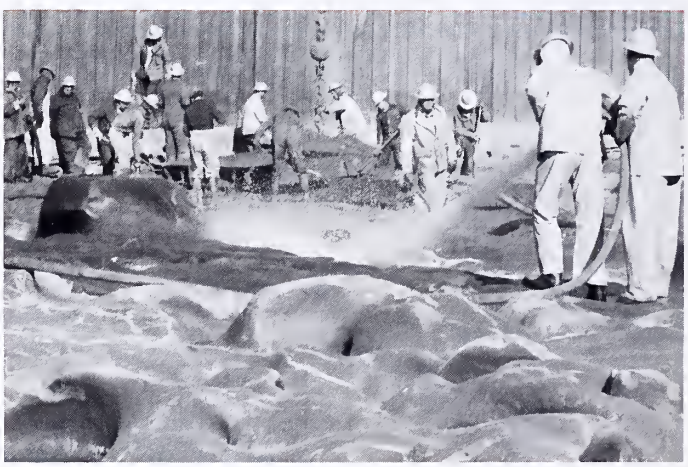


ILLUSTRATION 106. Workmen washing foundation rock at Dardanelle Lock and Dam complex, 2 December 1960.

(Courtesy Jesse W. Story)

The powerful Arkansas congressional delegation used these authorized New Frontier programs as models for securing funding for the stalled Arkansas River multipurpose and flood control projects. Although planners restricted the Arkansas River project rather rigorously to waterway development, they presented the project as part of a larger multi-government effort for economic development. This larger effort was not on the same scale as the Appalachian regional program, but the Arkansas River multipurpose and flood control projects constituted the largest Corps of Engineers project authorized as part of New Frontier regional development efforts.[61]

As part of its efforts to prepare for the increase in Arkansas River improvement work, the Little Rock District relocated its headquarters. In 1960 District headquarters personnel were housed in four Buildings: the Gay Company Building at Third and Broadway, the Lyons Building, the Harrel Building on Third Street, and the 555 Building on Broadway. In the fall of 1961 the General Services Administration completed a new seven-story federal building occupying the entire city block between Capital Avenue and West Fifth and State and Gaines streets in Little Rock. On Friday, 14 December 1961, Little Rock District headquarters personnel began moving into their new quarters, the sixth and seventh floors and parts of the first and fifth. They moved over four thousand pieces of furniture and equipment, set up offices, and had them fully operational within three days. For the first time since the Corps reactivated the District in 1937, all District headquarters personnel were under one roof. As Major General John C. Dalrymple, who as colonel commanded the District, later explained, such a move and consolidation of staff could only make an already efficient operation more so.[62]

Also during 1961, as part of the Corps reorganization the Chief of Engineers transferred District military construction activities to the Fort Worth Engineer District. The Little Rock District thus became free to concentrate on its civil works construction responsibilities: completion of the Greers Ferry and Beaver projects and commencement of full-scale construction of its portion of the Arkansas River improvement project.

By 1963 funding had been secured, and within a matter of weeks after the completion of the last two mountain reservoirs the Little Rock District began work on the remaining Arkansas River locks and dams.[63] It started with Lock and Dam Number 1, now known as Norrell Lock and Dam, and Lock and Dam Number 2 near Arkansas Post. The District began these structures in May 1963. Work proceeded upstream so contractors could use the completed navigation facilities to move their equipment. The District rapidly let contracts even though each construction site was unique. In May 1964 construction began on Locks and Dams Numbers 3 and 4 at Pine Bluff. Work began on Locks and Dams Number 5, west of Pine Bluff, and Number 7 (now Murray) at Little Rock in November 1964. The contractor began Lock and Dam Number 12 (now Ozark-Jeta Taylor) in December 1964. The contractor did not begin Lock and Dam Number 6 (now David D. Terry) just east of Little Rock until January 1965. Construction started at Lock and Dam Number 9 (now Arthur V. Ormond) near Morrilton in April 1965, with work beginning on what is now the Toad Suck Ferry Lock and Dam (Number 8) in July 1965. Construction started on the final navigation structure in the Little Rock District, Lock and Dam Number 13 (now James W. Trimble), in October 1965.[64]

Under the tenure of Colonel Charles S. Maynard as District Engineer the Corps decided to eliminate Lock and Dam Number 11. Following a 1963 series of engineering studies Jessie Turner suggested that if the depth of water in the pool upstream from Lock and Dam Number 10 (now Dardanelle) was increased by

ILLUSTRATION 107. Ozark-Jetta Taylor Lock and Dam (No. 12) under construction in 1966.

(Courtesy Jesse W. Story)

ILLUSTRATION 108. Last bucket of concrete being poured at Lock and Dam No. 13 (now James W. Trimble) in May 1968.

(Courtesy Jesse W. Story)

one foot and if Lock and Dam Number 12 was moved ten miles downstream, Lock and Dam Number 11 would be unnecessary. Colonel Maynard also reported that eliminating this lock and dam would save $30 million. The Corps accepted his recommendation despite some local residents' objections. When all twelve locks and dams were under construction, the work force numbered about six thousand and labor accounted for about 35 percent of the system's cost.[65]

In addition to building locks and dams, the Little Rock District was responsible for construction of dikes and revetments, structures to help stabilize riverbanks by preventing erosion, keeping the channel from shifting, and improving the alignment of the river. In its natural state the Arkansas River followed a meandering course with many sluggish oxbows and constantly shifting shoals and channels. Starting in 1950 the Little Rock District, using the limited funds available, began constructing channel cutoffs to correct adverse meanderings of the river and help fix a navigation channel in a relatively permanent location. The District also constructed traditional contraction works to increase the water's depth. The rectified channel consists of a series of easy bends of various curvatures, usually connected by straight stretches of river.[66]

At the White River entrance to the waterway, the Little Rock District created a channel 300 feet wide with bends usable throughout the year by tows up to 105 feet wide and 600 feet long. The bends remaining in the channel have radii between 2,000 and 3,000 feet. Tows up to 105 feet by 1,200 feet can thus use the channel for the six months of the year when the water in the Mississippi is at its higher level. The 300-foot-wide Arkansas Post Canal which the District built is straight and permits simultaneous upstream and downstream passage of the largest tows expected to use the waterway.[67]

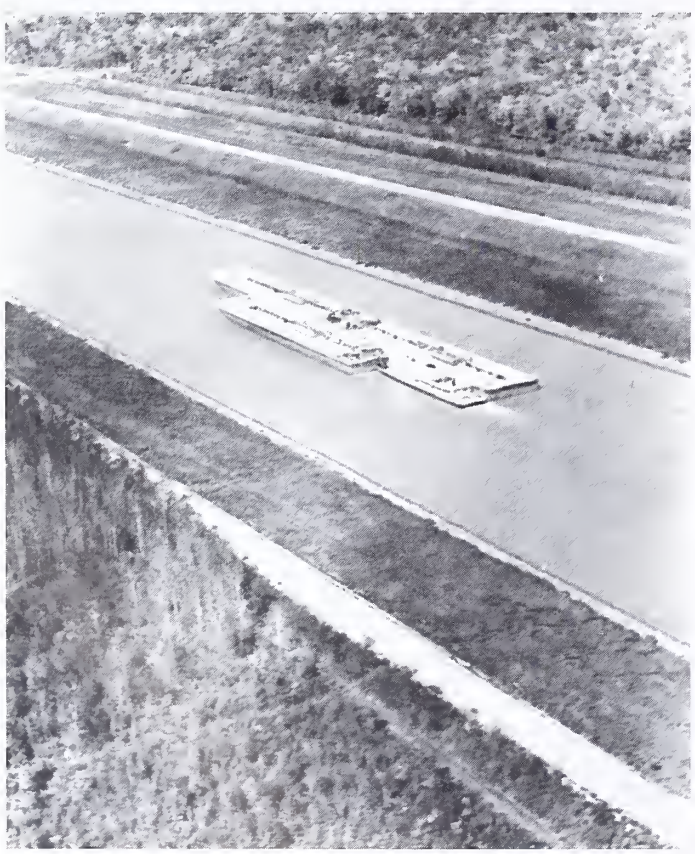


ILLUSTRATION 109. Arkansas Post Canal.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

The District designed the Arkansas River segment of the waterway to permit navigation by 1,200-foot-long tows. It predicted such tows might include fifteen 35-foot by 195-foot jumbo barges, three abreast, pushed by a towboat. It realigned the river so that the radii of the bends are usually at least 8,000 feet, although a few bends have radii between 6,000 feet and 4,400 feet. Two 105-foot by 600-foot tows can meet and pass in a 4,400-foot-radii bend with a 250-foot-wide channel. These bends are also adequate for a single 1,200-foot-long tow.[68]

The District not only had to modify the existing river to ensure that it was wide enough and the bends were gentle enough to accommodate the expected tows, it also had to modify existing man-made structures. The Little Rock District had to replace six highway and railroad bridges across the Arkansas River and to modify ten others so that barge traffic could travel under them. The District determined that all bridges needed a horizontal clearance of 300 feet, nearly three times the width of a three-abreast jumbo-barge tow. Some bridges had openings wide enough to accept barge traffic, but the channels could not be aligned with the openings. As a compromise, horizontal clearances beneath bridges in the Little Rock District portion of the waterway vary from 169 feet to 500 feet.[69]

The District also had to consider vertical clearances. It anticipated barge cargos as tall as four-story buildings. To ensure that all bridges had a minimum vertical clearance of fifty-two feet 98 percent of the time, the District modified bridges so that actual vertical clearance above normal pool elevation was at least this height.[70] (Movable-span railroad bridges were measured in the up, or open, position because they could be raised quickly on arrival of a tow.)

The District installed pier protection cells upstream from movable-span bridges and then, about fifteen years later, installed mooring cells safe distances upstream and downstream. Tows could thus tie up if they were temporarily delayed while the span was being raised or while an upbound tow having the right-of-way passed. Concurrent with installation of these mooring cells, the District also installed similar cells near the locks.[71]

Even though the Little Rock District began Dardanelle Lock and Dam first, it did not complete it first. Dardanelle not only creates a slack-water pool for navigation, it also includes penstocks to funnel water into four hydroelectric power generators. The District brought Units 1, 2, and 3 on-line in 1965; Unit 4 came on-line in January 1966. The staff at the Dardanelle powerhouse operates the generators at Ozark power plant, fifty-one miles farther west, by remote control, as well as operating their own run-of-the-river plant. Water cannot be held behind a dam for use when a power plant needs it. All water passing through a dam must either be used to generate power at the time it is passed through or be lost as a potential power source. This presents a contrast between the operation of the Arkansas River power plants and the Little Rock District power plants at the high-head flood control projects. The mountain plants are peaking plants, generating power only on demand. The District stores water, with its power-generating potential, behind the dam until the power is required.[72]

In addition to including a power plant and the remote operating system for another power plant, the Dardanelle complex includes the lock with the highest lift on the Arkansas River. The elevation change from the upstream to the downstream pool at Dardanelle is fifty-four feet. The District did not begin operating this lock until November 1969.

The first structure completed in the Arkansas River multipurpose improvement project was Lock Number 2 in April 1967. Unlike other locks in the system, the District did not build this

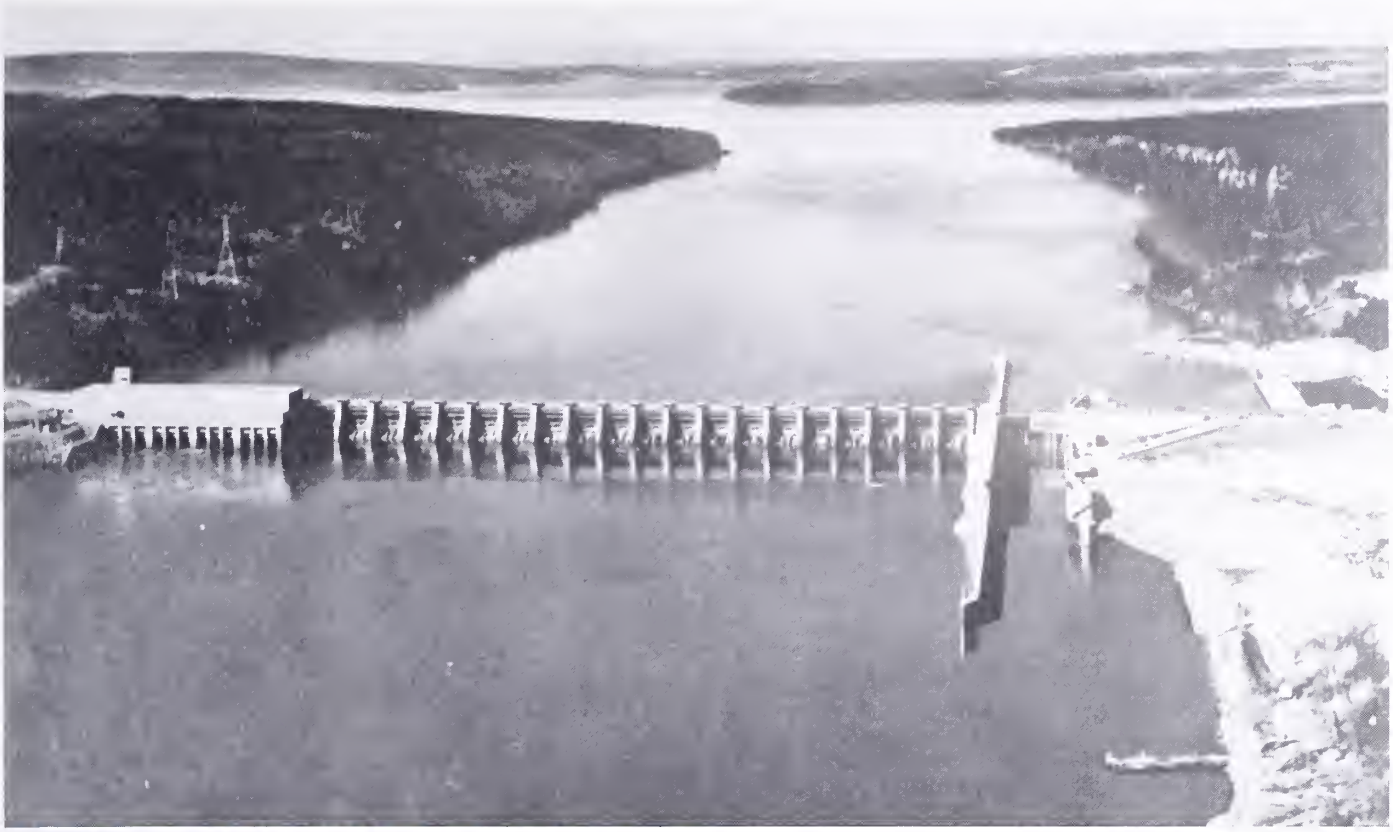


ILLUSTRATION 110. Dardanelle Lock and Dam and Powerhouse.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

lock in conjunction with its dam; in other respects Lock Number 2 is the same as other locks. It has a single chamber 110 feet wide and 600 feet long, the standard lock size throughout much of the Mississippi waterway, allowing for several vessels or a single tow as large as 108 feet by 585 feet. The approach walls of all but two locks, Numbers 1 and 2, are at least 600 feet long. Lock Number 2 is located on the Arkansas Post Canal, which carries the channel between the White and Arkansas rivers. Based on normal pool levels, this lock allows boats to climb the thirty-foot difference in elevation between the upper and lower pools. Dam Number 2 (now Wilbur D. Mills) is located on the Arkansas River at Notrebes Bend, just below where the canal joins the Arkansas. This dam controls the depth of the water in the western part of the canal as well as in the upstream reach of the Arkansas River between it and Dam Number 3.

Norrell Lock and Dam was the first complex finished. The District placed it in operation on 2 June 1967.[73] Colonel Frank P. Bane, then Little Rock District Engineer, accompanied by the contractor, various dignitaries, interested citizens, members of the press, and District employees, rode the first boat to pass through Norrell Lock. This lockage symbolized completion of the first step in the realization of a long-held dream. By the end of 1968 the District had completed not only the Wilbur D. Mills Dam but also lock and dam complexes numbers 3, 4, and 5 and the David D. Terry. On 4 October 1968 Senator John McClellan dedicated David D. Terry Lock and Dam before a large crowd; on 31 December 1968 Colonel Charles L. Steel, Little Rock District Engineer, declared the Arkansas River channel open to navigation. Boats could proceed from the Mississippi River to Little Rock, Arkansas.[74]

Union Barge lines' towboat the *Arkansas Traveler* was the first commercial user of the new waterway. It pushed two barges carrying twelve hundred tons of steel into Lock Number 1 on 31 December 1968. Heavy rains swelled both the White and Arkansas rivers, and their high and turbulent waters made the tow's upstream passage difficult. Accompanied most of the way by the Little Rock District's new river patrol boat, the *Dumas*, the *Arkansas Traveler* with its barges finally passed through David D. Terry Lock and tied up for the night on 3 January 1969.[75]

The trip from the Mississippi River to Little Rock generally takes about twenty-four to thirty-six hours, but it was not until Saturday, 4 January, that the *Arkansas* Traveler nosed its barges into the Port of Little Rock, located downstream from the center of the city, near the airport.[76] Although the contractors did not finish the port until April 1969, the Port Authority held its formal opening ceremony when the boat arrived. Despite this ceremony, the first outbound shipment did not leave the Port of Little Rock until April 1969, after construction was complete.[77]

By 1985 sixteen years after opening, the Port of Little Rock comprised 1,500 acres, including 1,200 acres allocated for industrial and commercial development. Interstate 440 gave port users access by expressway to Interstates 30 and 40. The Port of Little Rock's own railroad served the port. This railroad provided connections to the complementary routes provided by the Union Pacific and Southern Pacific (Cotton Belt) railroads. The port itself included a 350-foot wharf; a pier for handling liquids; a sixty-ton-capacity crane; a bulk loading facility; a bulk unloading terminal; a 30,000-square-foot heated warehouse; and a 150,000-square-foot foreign trade zone building for storing, manufacturing, and assembling products.

Since 1972 the Port of Little Rock has been a federally designated Foreign Trade Zone. This means that no customs duties or bonds need be paid on items held within the zone. Parts of

products can be prefabricated elsewhere, brought to the port, and assembled before customs formalities, duties, or bonds are imposed. Only when the finished product leaves the Foreign Trade Zone does the manufacturer pay the legitimate customs duties. Frequently this single customs duty is far less than cumulative duties would have been on each of the individually prefabricated parts. If the completed product is exported again rather than used in U.S. trade, the manufacturer need never pay U.S. customs duties on the foreign materials involved. In addition, foreign goods can be imported whenever the costs at the point of origin are most economically advantageous and can then be held until the next quota period or until the best price can be obtained in the U.S. market. This Foreign Trade Zone status thus induces manufacturers that use foreign-made components within the port complex.[78]

In 1985 three hundred thousand tons of goods moved through the Port of Little Rock. The Port Authority predicted that by 1986 the volume of goods moved would equal or surpass the capacity of the port. Therefore, the Little Rock Port Authority was preparing to expand port facilities and join with the federal government in construction of a slack-water harbor just downstream from the existing wharf.[79]

ILLUSTRATION 111. First barges arriving at the Port of Little Rock on 4 January 1968.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

The second public port on the McClellan-Kerr Arkansas River Navigation System, the Port of Pine Bluff, has been a slack-water harbor since its completion in 1970. The designers located it off the main waterway on an old bend of the Arkansas that the Corps cut off during construction of the multipurpose project. The two-thousand-acre cutoff channel, now known as Lake Langhofer, is eight miles long and connects at its lower end with the navigation channel. The lower five miles are navigable and constitute the harbor.[80]

In 1985 the Port of Pine Bluff featured a 372-acre harbor industrial district and a versatile 22-acre public terminal. Three highways offered roadway access, while the Southern Pacific and Union Pacific railroads offered rail access. The port itself included a 160-foot public terminal wharf for direct transfer of cargo to or from barges, railcars, and trucks; more than 600,000 square feet of warehouse and transit shed capacity; grain elevators with a 4-million-bushel capacity; liquid cargo facilities with a 7.5-million-gallon storage capacity; pipeline and conveyor systems for unloading and loading; a 50-ton crane; an enclosed 25-ton bridge crane with all-weather operation; numerous special-purpose terminals; a barge fleeting area; harbor towboat service; and barge cleaning and repair services.[81]

In addition to the public ports at Little Rock and Pine Bluff, several privately owned port facilities served the area when the waterway opened in 1969. Dominant among these was Jones-Kirby Port of North Little Rock, approximately two miles upstream from the Port of Little Rock. Established in 1969 but out of business by 1985, its operators located this private port in a dredged area perpendicular to the Arkansas River.[82]

Even though unfinished in early 1969, the public and private port facilities at Little Rock and Pine Bluff adequately handled the initial traffic plying the improved Arkansas River in January 1969. At that time Little Rock was the terminus of the waterway, but the project soon opened up more of the river.

The Little Rock District completed the first lock and dam upstream from Little Rock in April 1969. This was not Murray Lock and Dam, the next in the sequence up the waterway from Little Rock; it was James W. Trimble Lock and Dam, three miles east of Fort Smith. James W. Trimble Lock and Dam is last in the line of lock and dam structures in the Little Rock District portion of the Arkansas River navigation system. The dam consists of an earthfill embankment and a concrete-gated spillway. The spillway is about 1,050 feet long with fifteen 60-foot by 30-foot tainter gates. The lock has a maximum lift of 22 feet.[83]

Upstream from James W. Trimble Lock and Dam, the Arkansas River forms an arc, passing on the east, north, and west sides of Fort Smith. The Fort Smith Port Authority did not begin construction of its port until 1971. It finished the first phase of construction that year but continued construction through 1975. By 1985 the Port of Fort Smith occupied thirteen acres in an industrial area near downtown Fort Smith. Interstate 540 connected the port to Interstate 40, and the Burlington Northern Rail-

ILLUSTRATION 112. Port of Pine Bluff.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

road provided rail access. The port itself offered two docks; facilities for receiving grain, coal, and steel via truck or rail; and 117,000 square feet of warehouse space in four buildings.[84]

In Van Buren, Arkansas, on the north side of the river across from Fort Smith, the Farmer's Co-op developed a port facility. Privately owned, it stored and transferred dry cargo among barge, rail, and truck transports and handled various commodities plus supplies and fuel for towboats. In 1985 facilities included a fleeting area about one mile downstream from the Farmer's Co-op dock, a towboat for moving barges, a crane, a conveyor belt, a warehouse, a railroad connection, an asphalt-surfaced area for open storage, and a dock with pile dolphins.[85]

Another major transportation-related facility was constructed near Fort Smith. In July 1971 the Little Rock District completed a highway bridge, using James W. Trimble Lock and Dam as its foundation. During the early 1960s the District facilitated the building of this bridge by designing the lock and dam to accommodate the bridge. In the late 1950s Congress for the first time had given the Corps authority to strengthen and adapt its river lock and dam structures for eventual use as foundations for roadways and bridges. Although the authorization did not specify it, Congress had granted the authority so that the Corps could plan for such roadways during its Ohio River modernization project, which began in 1956. The Corps did not use its new authority in its Ohio River projects. During the early 1960s the Little Rock District apprised authorities of the economic benefits of partially funding limited additional structural features during initial construction to allow Arkansas to build highway crossings supported by the District's lock and dam structures.[86]

Between 1963 and 1965 the Little Rock District and the Arkansas Highway Department worked out and entered into an agreement covering five of the Little Rock District's Arkansas River locks and dams. By the terms of this agreement the District made design and structural changes in Locks and Dams Numbers 3, 4, 8, 9, and 13. These structures could then accommodate two-lane high-level roadways should the state of Arkansas want them. The state assumed the additional design and construction costs, which were small compared to those of independent bridge piers and abutments. In addition, by the terms of the agreement, if Arkansas wanted to utilize the foundations created to support river-crossing roadways, the federal government had committed itself to helping fund the construction of the roadways and bridge approaches.[87]

When the Little Rock District eventually built the highway bridges for the state of Arkansas across James W. Trimble Lock and Dam and Toad Suck Ferry Lock and Dam, it did not have to spend substantial sums for bridge piers and abutments. It prepaid these costs at not only discounted but preinflation rates. The highway department's costs were limited to funding the District's construction of the cheapest parts of the river-crossing structures, and the federal government paid a share too. The same procedure will apply if Arkansas has the District build roadways across Locks and Dams Numbers 3 and 4 and the Arthur V. Ormond Dam, which the Corps built with this eventuality in mind.

The Little Rock District completed the Arthur V. Ormond Lock and Dam near Morrilton, Arkansas, in July 1969, three months after it completed the James W. Trimble complex. Although these structures are almost identical, Arthur V. Ormond Dam is slightly shorter and the maximum lift at Arthur V. Ormond Lock is nineteen feet, three feet less than at James W. Trimble Lock.[88]

As at Arthur V. Ormond Lock and Dam, the Little Rock District made rapid progress on the Arkansas River during the

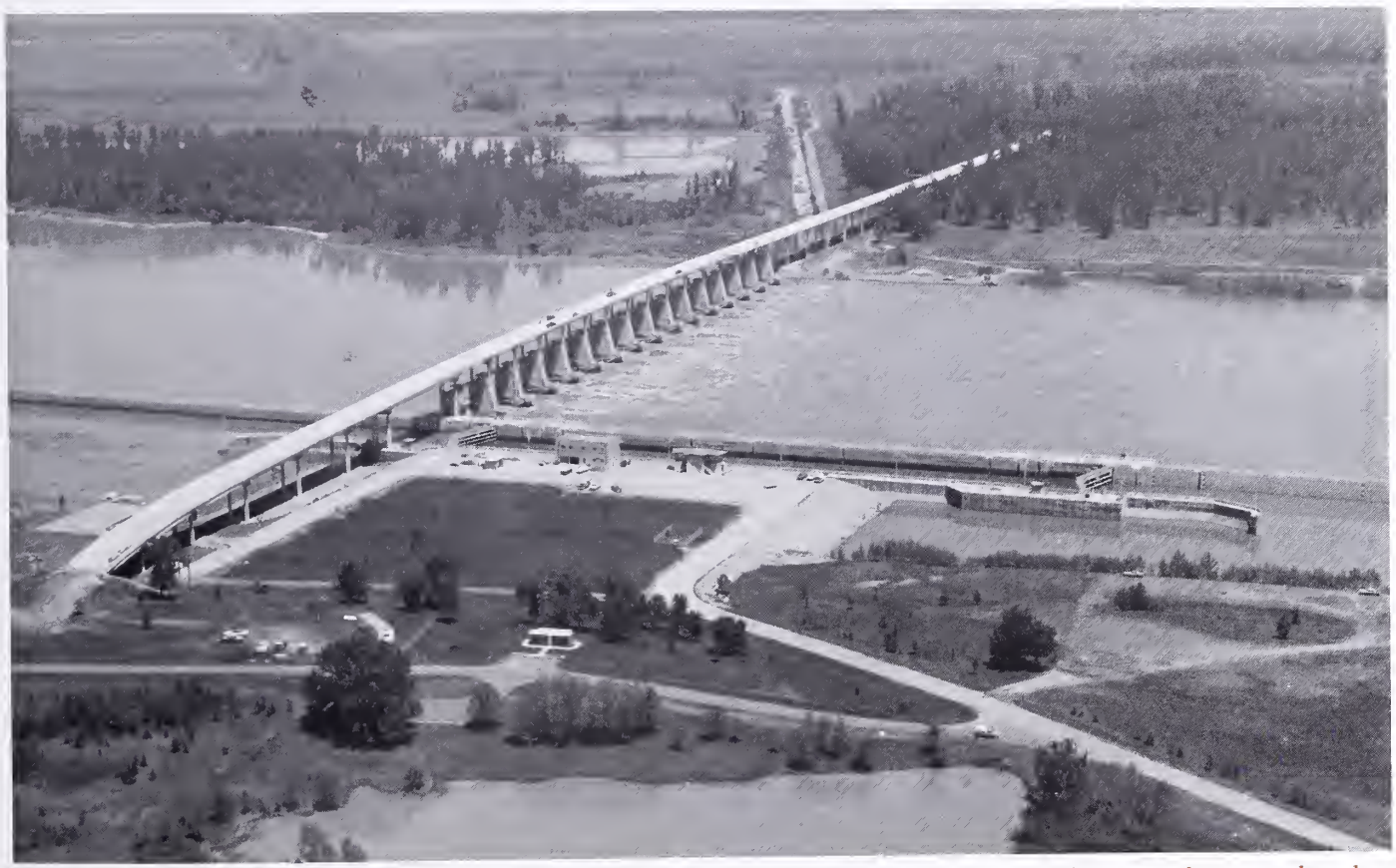


ILLUSTRATION 113. Highway bridge over Lock and Dam 13 completed in 1978, although road not complete at each end. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

summer of 1969. In November the District placed the rest of the locks and dams in the Little Rock District portion of the Arkansas River navigation system in operation. Except for the modifications in Toad Suck Ferry to accommodate a two-lane high-level roadway, Murray Lock and Dam and Toad Suck Ferry Lock and Dam were very similar to the other locks and dams in the system.

The designers located Lock and Dam Number 8 near the site of a historic Arkansas River ferry crossing in use since at least 1823. Arkansas assumed operation of the ferry service in 1956, and a lock and dam structure supporting a highway would remove it from the ferry business at this location. Therefore, the state authorized construction of the roadway and necessary temporary approaches to it to begin as soon as possible. The District completed work in September 1970 and a bridge replaced the ferry.

Since steamboat days ferry passengers at this location had frequented a nearby rustic tavern, Toad Suck Tavern. Local legend attributes the tavern's name to the drinking habits of its patrons when, in steamboat days, boat hands and travelers stopping at the tavern were such heavy drinkers that one traveler was led to comment that "those fellows would suck at the bottle until they would swell up like toads."[89] True or not, the ferry had assumed the name of the tavern, and the name remained long after the tavern disappeared. To comply with local residents and historians who did not want the name of the ferry to be lost, determined local interests attached the name to the new lock and dam structure.[90]

The 27 September 1970 formal dedication of the Toad Suck Ferry Bridge and its temporary approaches included a formal dedication of a historic marker at the site of the traditional ferry landing. Arkansas Lieutenant Governor Bob Riley assured the assembled crowd at that dedication that the name Toad Suck Ferry was firmly and forever implanted on not only the Little Rock District lock and dam structure but also the state bridge and the traditional ferry landing. Congress officially renamed the Corps structure Toad Suck Ferry Lock and Dam in 1971.

By the time the Little Rock District completed Dardanelle Lock and Dam in November 1969 private port development was well advanced at Dardanelle. Private interests supported construction of Keenan's Port of Dardanelle in 1962, and the facility was operational by December 1969. By 1985 it handled various commodities plus supplies and fuel for towboats. Facilities included three cranes, a conveyor belt, bulk grain storage, a heated warehouse, and a row of pole dolphins. A short rail line, the Dardanelle and Russellville Railroad, connected the Port of Dardanelle to the Union Pacific Railroad at Russellville. State highway 7 provided access to Interstate 40, which runs west to Fort Smith and east to Little Rock.[91]

The District also completed its final structure, Ozark-Jeta Taylor Lock and Dam, in November 1969. Located near Ozark, Arkansas, Ozark-Jeta Taylor is similar to Dardanelle in that its dam includes facilities to generate power. Unlike the Kaplan-type turbines powering the hydroelectric generators at Dardanelle, turbines at Ozark-Jeta Taylor are inclined-axis tube turbines. These five Allis-Chalmers inclined-axis turbines are the only inclined-axis turbines in the Little Rock District, and some of only a few in the United States. By the 1960s slant-axis turbines were used in Europe, but in 1985 the ones at Ozark-Jeta Taylor were physically the largest tube turbines in the world.[92]

The use of inclined-axis tube turbines, tilted turbines with their shafts inclined upward in the downstream direction, greatly reduces the cost of constructing power plants compared to the cost of using conventional vertical-shaft turbines. Low-head, large-diameter, propeller-type waterwheel turbines, such as the inclined-axis ones at Ozark-Jeta Taylor, do not require the deep scroll cases that higher head, Kaplan runner-type waterwheels installed at Dardanelle and the flood control dam power plants in the mountains do. Large propeller-type waterwheels, like those at Ozark-Jeta Taylor, are suitable for operations where the height of the water upstream from the dam is not appreciably more than that downstream. The maximum difference is only thirty-four feet between the upstream and downstream pools at Ozark-Jeta Taylor, compared with the more than two hundred feet between the upper and lower pools at the White River basin projects or the fifty-four-foot difference in elevation at Dardanelle.[93]

As a result of the application of this innovative low-head power generation technology at Ozark, the design and layout problems associated with the dam and powerhouse were immense. The extra expenditures involved were counterbalanced in part by savings resulting from a decrease in the amount of rock excavation needed and a decrease in the length of the powerhouse. However, the smaller size of the powerhouse required that the diameter of the generators be reduced. To achieve the same power output as in earlier designs, the District used a speed increaser to provide the generator with 514 revolutions per minute while being driven by a turbine at 60.3 revolutions per minute. The District put generating Unit 1 into operation on 17 November 1972, followed by Units 2, 3, and 4 in 1973; it placed the last unit, Unit 5, in commercial operation on 3 May 1974.[94]

In 1975 the District's engineers began to encounter problems in the generating units. Operations were hampered by cracked shafts and broken coupling bolts. Slight bows developed in the fifty-five-foot-long by five-foot-diameter shafts of the inclined turbines because of gravitational forces. Kaplan turbines do not bow because of the vertical alignment of the shafts. As the shafts rotate, the low points of the sagging shafts are repeatedly stretched while the tops of the shafts are compressed, similar to what happens when a wire is repeatedly bent. This action caused extremely small cracks in the metal shafts, and the Arkansas River's high salt content accelerated the cracking. The same processes caused cracking in the three-inch-diameter stud bolts connecting the turbine runner hubs to the adapter cones and in the five-inch-diameter bolts connecting the turbine runner hubs to the shafts. Unit 2's turbine shaft cracked after 10,000 hours of service. The three-inch bolts in Unit 4 failed after 10,349 hours of service; on Unit 5, the five-inch bolts failed after 11,062 hours.[95]

After much testing, the Corps developed modified shafts and bolts, which Allis-Chalmers built in its shop. To remove and reinstall the shafts without moving the speed increasers, engineers had to cut the turbine shafts in half and provide additional flanged connections at that point.[96]

Although the power-generating facilities at Ozark-Jeta Taylor have continually had maintenance problems, they produced more power after 1974 than any mountain reservoir power plant. This is partially accounted for by the fact that the Ozark Power Plant, like that at Dardanelle, is a run-of-the-river, not a peaking, plant. Consequently, the District runs the Ozark plant more than it runs the mountain reservoir peaking plants.[97]

On 29 December 1969, less than a month after the Little Rock District completed the final lock and dam in its portion of the Arkansas River Multiple-Purpose Project, Colonel Charles L. Steel declared the Arkansas River channel open to navigation to the Arkansas-Oklahoma state line. By the end of 1970 the Corps declared navigation open to the upstream end of the project at the Port of Catoosa, near Tulsa. On 21 January 1971 the first barge, carrying eighteen hundred rolls of newsprint, traversed the entire 445-mile-long waterway.[98]

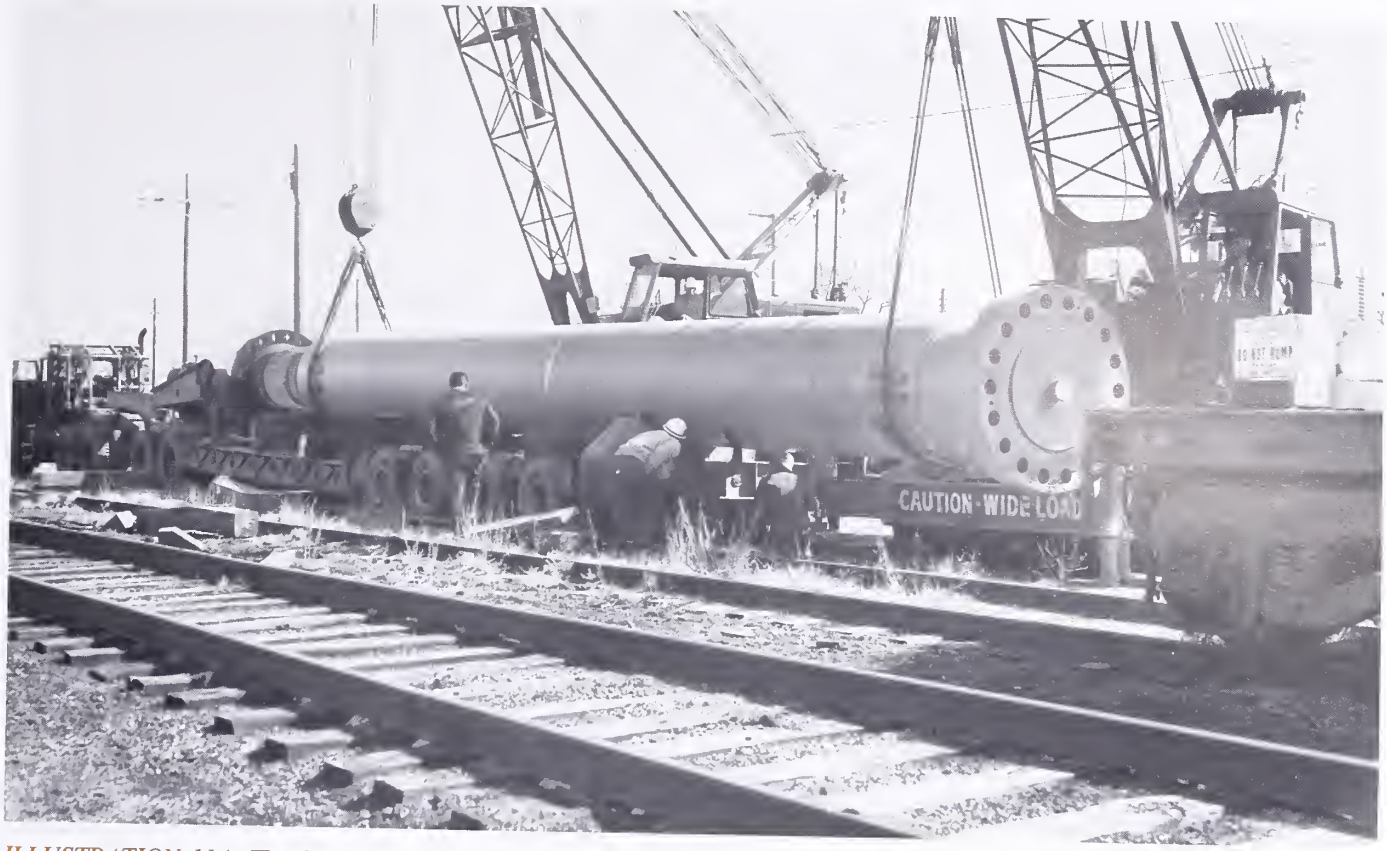


ILLUSTRATION 114. The first inclined-axis turbines arriving for installation at Ozark-Jeta Taylor Powerhouse in 1970. (Courtesy Jesse W. Story)

ILLUSTRATION 115. Water wheel being assembled at Ozark- Jeta Taylor Powerhouse. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

When this barge reached Catoosa the project was no longer known as the Arkansas River Multiple-Purpose Project. As a result of legislation introduced by Representative Wilbur D. Mills, on 5 January 1971 Congress named the waterway the McClellan-Kerr Arkansas River Navigation System in honor of two of the men who contributed most to this dream becoming a reality, Senators John L. McClellan of Arkansas and Robert S. Kerr of Oklahoma. The legislation also renamed Locks and Dams Numbers 1, 6, and 7 after other historic boosters of the river project. Lock and Dam Number 1's name became Norrell Lock and Dam in honor of former Representative W.F. Norrell, and Lock and Dam Number 6 became David D. Terry Lock and Dam named for the former Little Rock congressman and state rivers and harbors official. Congress renamed Number 7 for Jack Murray, traffic manager for the Little Rock Chamber of Commerce and long-time river booster. The legislation also officially renamed Lock and Dam Number 10 Dardanelle Lock and Dam and Lock and Dam Number 8 Toad Suck Ferry Lock and Dam. Finally, this 1971 act officially designated the canal from the White River to the Arkansas River the Arkansas Post Canal and renamed the cutoff channel at Boyd's Point in Pine Bluff Lake Langhofer.[99] In 1976, as the result of legislation sponsored by Senator McClellan, Congress renamed Lock and Dam Number 12 Ozark-Jeta Taylor Lock and Dam in honor of its location and Mr. Jeta Taylor, well-known advocate of the Arkansas River improvement program.[100]

Almost immediately after this act, on 22 January 1971 the port authority officially dedicated the Port of Muskogee in Oklahoma. On 5 June 1971 its port authority dedicated the Tulsa-area Port of Catoosa. The Catoosa dedication served to officially dedicate the entire McClellan-Kerr Arkansas River Navigation System. President Richard M. Nixon was the principal speaker. In his remarks the President stressed that completion of the project represented the triumph of bold vision over the skepticism of those with less imagination. He pointed out that even such a celebrated visionary as Will Rogers said that it would be cheaper to pave the Arkansas than to make it navigable. As the plaque unveiled at the June 1971 dedication of the system records, this Corps accomplishment was "Conceived in Dust, Cradled in Flood, Created by Men." Many of these creative people were Little Rock District personnel.[101]

The dedication also marked a turning point for the Little Rock District. Since 1937 the energies of the District had been devoted to construction of first the flood control and hydroelectric power high dams and later the Arkansas River projects. After 1970 the District's mission shifted from project completion to project operation and river, stream, and waterway regulation. It shared these new goals with all but a few Corps Districts. This was also a time when the people of Arkansas and southern Missouri would begin to experience the greatly expanded benefits of the Corps' involvement in the region.

ILLUSTRATION 116. President Richard Nixon dedicating the McClellan-Kerr Arkansas River Navigation System on 5 June 1971. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Chapter IX

The Emphasis Shifts, 1969-1985

With completion of the McClellan-Kerr Arkansas River Navigation System, the Little Rock District had no major construction project to complete. Its orientation shifted to operations and maintenance.

During 1971, the first year the Corps operated the entire waterway, shippers moved approximately 4.3 million tons of cargo. During the next five years the tonnage carried slowly increased. In 1976 haulers moved about 6.5 million tons of cargo, a record amount for a single year. By 1977 the rather sharp national business recession of the early 1970s passed and commercial activity on the McClellan-Kerr Arkansas River Navigation System increased dramatically. The approximately 9.1 million tons of cargo shippers moved in 1977 represented a 40 percent increase over the previous record set in 1976. In addition, ocean-going barges began using the waterway in 1977. These advances occurred despite adverse weather.[1]

Commercial haulage on the waterway increased again in 1978, to about 10.2 million tons. In 1979, however, national economic conditions deteriorated more seriously than in the early 1970s and commercial use declined. Shippers moved nearly 15 percent fewer tons of cargo on the system in 1979 than in 1978. Despite temporary increases in individual years, this general pattern of decline continued through 1983. Shippers that year moved less than 8.2 million tons of cargo.[2]

As the nation emerged from the recession, shippers began using the McClellan-Kerr Arkansas River Navigation System more fully, moving approximately 8.3 million tons of cargo in 1985. Although this tonnage represents only 63 percent of the annual volume of cargo estimated by the Corps, it reflects an upward trend. By 1985 shippers moved more cargo each year on the McClellan-Kerr Arkansas River Navigation System than on the Missouri River.

The Corps developed its estimates of the annual amount of cargo expected to be shipped on the waterway in 1946, before construction began, and it revised its estimates several times before construction was complete. In its final revision, the Corps predicted that 13.2 million tons of cargo would be carried on the improved Arkansas River each year. The Corps used this figure to project, a 1.5-to-1 benefit-to-cost ratio for the entire multipurpose project including navigation, flood control, hydroelectric power generation, and other benefits.[3]

The volume of cargo carried on the McClellan-Kerr Arkansas River Navigation System is not apparent to the casual observer: so few vessels carry so much cargo. Tows consist of barges tied to a towboat to act as a single vessel, with the towboat serving as the power unit.

Commercial towboats from 800 to 6,000 horsepower operate on the McClellan-Kerr. Most have a square bow with upright pusher "knees" against which barges are snugged and securely lashed. The navigation system was basically designed for towboats pulling eight jumbo barges. The system can, however, accommodate tows twice this size in most places. A jumbo barge is 35 feet wide by 195 feet long. In a standard eight-barge tow, the first tier in front of the towboat usually consists of barges tied two abreast, allowing the towboat to move alongside the two barges when the tow is passed through the locks. The next two tiers consist of barges tied three abreast. This configuration results in a tow approximately 600 feet long and 105 feet wide.

Barges differ greatly according to the kinds of cargo they carry. Hopper barges are the most versatile and most frequently used on the McClellan-Kerr Arkansas River Navigation System. Open hopper barges carry materials such as coal, sand, crushed rock, and scrap metal which do not need protection from weather. Other hopper barges have watertight covers to protect their cargo from weather. Shippers commonly use covered barges to carry commodities such as grains and dry chemicals.

Deck barges have no hold; cargo is tied to the deck. Deck barges commonly carry machinery or heavy equipment and construction materials such as sand or gravel. A deck barge can carry different commodities and equipment simultaneously.

Tank barges move liquids, especially petroleum or petroleum products. Some carry chemicals and such commodities as molasses.

LASH (Lighter Aboard Ship) and Seabee barges are specially designed river barges often used in international trade. Shippers tow LASH barges like other river barges, but when they reach an ocean port longshoremen hoist the barges aboard a deep-water transoceanic vessel. Special "mother" ships can transport seventy-three LASH barges to a foreign port where longshoremen off-load them and shippers tow them, using the same methods as those used on U.S. rivers.

A Seabee barge operates on the same principle as a LASH barge except a Seabee is twice as large as a LASH. Special carrier ships can haul thirty-eight Seabee barges.

Normal capacity of the jumbo open-hopper barges used most frequently on the McClellan-Kerr Arkansas River Navigation

ILLUSTRATION 117. Typical eight barge tow.
(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

System is approximately 1,500 tons. Since a typical eight-barge tow on the McClellan-Kerr moves 12,000 tons of cargo at a time, only 692 such typical eight-barge tows a year would move the 8.3 million tons of cargo carried on the system in 1985. The system operates 24 hours a day, 365 days a year, so as few as two typical eight-barge tows daily would carry this much cargo, compared to 1,200 semitractor trailers a day for an equivalent amount of cargo. (An average over-the-road semi-conducting interstate commerce carries twenty tons.)[4]

Recreational uses of the waterway are more apparent than commercial ones. Thousands of pleasure boaters enjoy the vast expanses of water made more accessible by the twelve locks and dams in the Little Rock District portion of the system. Lock operators pass pleasure craft through the District locks at no charge. Corps policy stipulates that pleasure boaters, however, wait if government, passenger, or commercial vessels are also seeking passage.

Pleasure craft cruising the waterway are outnumbered by people fishing there, a result of the Corp's multipurpose improvement approach. Since the Corps completed the McClellan-Kerr Arkansas River Navigation System, the Arkansas River has become known as the site of some of the best bass fishing in the United States. The construction project led to dramatically more species of fish in the river. Biologists knew of 43 species of fish in the river before the Corps' 1960s construction efforts; by 1976, 109 species existed in the same area. One of these new species was striped bass. The channel rectification and stabilization efforts, part of the improvement project, produced a number of backwater areas offering particularly good fishing.[5]

In addition to recreation derived from Corps development of the navigation system, the Little Rock District constructed numerous parks and recreational facilities along the waterway.

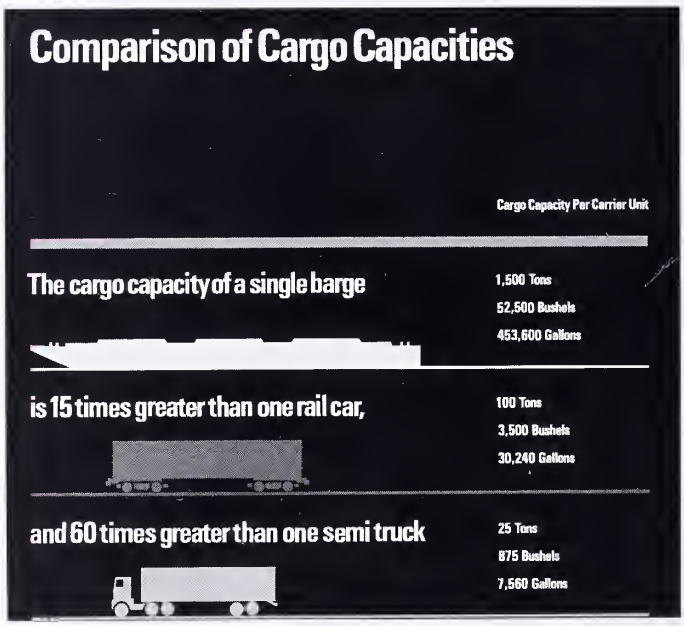


ILLUSTRATION 118.

Congress authorized the Corps to provide recreational facilities at its reservoirs beginning in 1944, and the Little Rock District began providing them in 1946. As recreational use of the District's reservoirs grew in the 1940s and 1950s, the District staff's expertise in recreational management grew.

By mid-1960 Chief of Engineers General Emerson C. Itschner was working to enhance his entire staff's understanding of recreational use opportunities as an incentive for Corps civil works projects. In January 1961 the Office of the Chief of Engineers

ordered that Division Engineers ensure development of policy guidelines for recreational facilities within the Districts.[6] By April 1962 it was Southwestern Division policy to recognize the Corps' responsibility to meet the ultimate recreation demand associated with every project, even non-reservoir ones. Southwestern Division Districts were ordered to obtain the basic data necessary to assess properly the recreation demands at each project. By 1962 it became Southwestern Division-wide policy to give recreation equal status with other purposes in project studies and formulations.[7]

In his fall 1962 dedication of the Greers Ferry project in the Little Rock District, President Kennedy addressed the recreational potential of Corps projects.[8] In November of that year, Congress identified outdoor recreation as a project purpose for which costs could be allocated equally with other purposes. Senate Resolution 342, known as Senate Document 97, also decreed that the Corps should fully consider recreation as a project purpose in project formulation and planning.[9] Congress furthered this policy in July 1965 when the Federal Water Project Recreation Act ordered the Corps to consider fully the opportunities every project afforded for outdoor recreation and for fish and wildlife enhancement. It further ordered that planning for recreational development of every project be based on coordination of recreational use of the project area with the use of existing and planned federal, state, or local public recreational development.[10]

As a result, in 1967 the Little Rock District organized its first Recreation Facilities Section. With planning assistance from the Engineering Division, this section oversaw management of the fifty-five recreational areas the District opened by 1985 along the McClellan-Kerr Arkansas River Navigation System. The recreation areas vary from ten to nine hundred acres and include picnic tables, campgrounds, trailer sites, boat launch ramps, playgrounds, sports areas, and related amenities. People began to use District-developed parks along the waterway immediately. By 1977 the District total for visitors at its recreational facilities along the waterway exceeded 9.3 million. Public use has increased significantly since then, with 10.1 million visitors using the Corps' facilities along the navigation system in 1983.[11]

Recreational use that developed around the completed system within the Little Rock District has been less intensive and has had a different impact on the river valley than recreational use and development at the District's mountain reservoirs. Most Arkansas River recreational visitors are day or weekend users from small towns and urban areas of the river valley itself; the mountain lakes attract visitors and retirees from beyond the local area. The river valley economic development consequently differs from development in the mountainous areas of the District.

The concomitant industrial development related to successful commercial waterway navigation disappointed some. These people frequently have not recognized the waterway's commercial success. Industrial and general economic development is a long-term process; fifteen years in a waterway's life is not long in economic development terms. During this time the nation suffered two major business recessions during which economic development of the waterway region was neither planned nor supported by an effective regional organization.[12]

In February 1972 Governors Dale Bumpers of Arkansas and David Hall of Oklahoma attempted to establish a permanent organization, the Arkansas River Development Corporation (ARDC), for bistate development of the waterway. During the three years the organization operated, it attempted to serve as a regionwide chamber of commerce or industrial development agency, while simultaneously serving as a planning agency for development along the entire waterway.

After eighteen months of study ARDC recommended creation of a federal interstate compact which would establish an Arkansas River basin commission to finance projects and plan development for the entire Arkansas River valley. The recommendation was never acted upon. Governor Bumpers became a senator and Governor Hall became involved in a political scandal that diminished his effectiveness. Without the two governors who helped create it, ARDC became ineffective and its operations were officially terminated in 1975.

Through its permit program the Corps of Engineers could perform some functions the governors intended for ARDC and those ARDC intended for the Arkansas River basin commission. However, although the Corps was authorized to regulate activities on the nation's navigable waters in 1899, the Corps does not legally coordinate commercial functions.

Until 1960 this Corps-regulating function was restricted to ensuring navigability of the nation's waterways. Individuals and organizations seeking to do work or to place structures in or across navigable waters or to discharge material into these waters had to obtain a permit from the Corps. Construction of piers, wharfs, docks, bridges, and other structures as well as channel excavation and the placement of riprap, groins, mooring devices, and similar activities required Corps permits.

Congress defined the navigable waters of the United States as all waters subject to the ebb and flow of the tide and which are presently, have been in the past, or may be in the future used to transport interstate commerce. The Arkansas River is subject to this regulatory authority, and, consequently, developers are subject to apprising the Little Rock District of most proposed projects along the river. In the process of reviewing the plans of projects likely to be done, the District informally shares information, coordinating similar services and activities.

Through Section 206 of the Flood Control Act of 1960, Congress expanded the Corps' area of jurisdiction along the nation's rivers and streams. To encourage and guide the wise use of flood plains for the benefit of the national economy, welfare, and environment through proper planning at all levels of government, the Corps offers technical and floodplain management planning assistance to state and local governments, who continue to make the decisions. In the case of the Little Rock District, providing management services allows the District to assist in coordinating the development of the river valley. Since most of the District's floodplain management work deals with urban areas, the largest number of requests for the District's free technical assistance comes from private and public parties in the Little Rock metropolitan area.[13]

In 1972 Congress significantly enlarged Corps regulatory responsibilities. As a result of Section 404 of the Federal Water Pollution Control Act of 1972, as amended, the Corps' regulatory authority was expanded to include responsibility for regulating the discharge of dredged or fill material into U.S. waters. The act expanded the Corps' authority to regulate dumping of pollutants in navigable streams. This authority, first granted the Corps in 1899, was expanded after 1972 to protect the chemical and biological integrity of the waters of the United States.

The District Permit Section determines the potential benefits and damage from any proposed action. The District staff not only gathers the technical opinions of its own experts on the proposed action, but also coordinates the permit review process by other Corps officials and representatives of other federal, state, and local governmental agencies such as the Environmental Protection Agency and the Fish and Wildlife Service. The District considers all factors relevant to the proposal. These include, but are not limited to, conservation, economics, aesthetics, historic

values, general environmental concerns, navigation, land-use classification, fish and wildlife, recreation, flood damage prevention, water supply, water quality, and the general needs and welfare of the public. The Little Rock District issues permits only when it determines that the proposed project is not contrary to the public interest.[14]

In 1975 as a result of the federal court case *The National Resources Defense Council* v. *Calloway*, the Corps issued a regulation further expanding the jurisdictional limits of its Section 404 permit coverage. It defined the phrase "waters of the United States" as used in the Clean Water Act of 1972 to include freshwater wetlands adjacent to navigable waters. It further defined the term "wetlands" to embrace areas inundated or saturated so frequently that they support vegetation peculiar to saturated soil. In December 1985 the Supreme Court upheld this definition of the "waters of the United States" and thus confirmed the regulatory authority of the Corps of Engineers over millions of acres of privately owned property.[15]

In evaluating Section 404 permits the Little Rock District has conducted the program in a manner that reflects the national concern for the protection and utilization of important resources. One of the principal examples of this type of action by the District is in the Faulkner Lakes area of central Arkansas, just outside North Little Rock, an area of about twenty-five square miles including about eight square miles of lakes and wetlands.[16]

In 1976 commissioners of the Faulkner Lake Drainage District (FLDD), an old district formed in 1916 to construct drainage ditches in the area, began once again collecting taxes to perform maintenance on its original channel improvements. In 1978 the FLDD attempted to drain Faulkner Lake. Because farmers and a federal court order initiated by the Corps quashed its attempt, in 1982 the FLDD applied for a Section 404 permit for extensive channel maintenance and modification work. Although the FLDD would not have drained Faulkner Lake, the channel work would have significantly affected wetlands and downstream water quality. The Little Rock District denied its permit application in 1983.

In 1984 the FLDD applied for a Section 404 permit for a much smaller project to enhance drainage only from the Rose City area. The Little Rock District Permit Section judged this project to have significant benefits outweighing its adverse impacts and issued a permit heavily conditioned for environmental protection.

To perform such regulatory functions while serving its recreational development, management, and operations functions, the Little Rock District had to add new categories of technical specialists to its staff. The addition of technical specialists in such disciplines as biology and recreation made the District a leader in natural resource management. Simultaneously, the outlook of the Corps changed. No longer were national economic development and economic feasibility the only criteria used to evaluate a Corps project; in accord with the National Environmental Policy Act, a proposal also had to have environmental acceptance.

The District views itself mainly as promoting economic development, not as a promoter of natural resources or recreation. For example, after the waterway opened, Arkansas Power and Light made significant investments in the Little Rock District portion of the Arkansas River valley. A 1978 Corps of Engineers study found that industry had invested more than $1.8 billion between 1968 and 1977 in an eighteen-county region along the Arkansas River in Arkansas, creating more than 50,000 jobs as a result.[17]

Perhaps even more important than these specific economic development accomplishments, the completion of the McClellan-Kerr Arkansas River Navigation System had a significant psychological impact within the Arkansas River valley. Before the waterway, all communities within the valley were characterized by a sense of inferiority which was a critical factor in the region's lack of economic development. The opening of the waterway boosted self-confidence among the communities inhabitants, and completion of the navigation project led to efforts to accomplish other ambitious economic development projects. This spirit of optimism and the dissipation of a long-term sense of regional inferiority were particularly important in areas of the river valley that experienced the least prewaterway economic growth and development.[18]

A Change in Mission

Particularly important for the Little Rock District was 1969, when it completed its portion of the McClellan-Kerr Arkansas River Navigation System and turned to its operations, maintenance, and regulation missions. After having been an especially active construction unit for more than thirty years, the District's new focus was unfamiliar and uncomfortable for many staff members. However, as in the years between World Wars I and II, the Little Rock District was not alone in turning from building to operation and maintenance.

As early as 1964 the cost of the Vietnam War began to have an impact on the allocation of federal funds for nondefense domestic projects. The federal government began to reduce funding for civil works projects. President Lyndon Johnson even proposed drastically reducing the funding for the construction of the McClellan-Kerr Arkansas River Navigation Project. However, Senators McClellan and Fulbright convinced him that slippage in the project would result in false economies and eventually result in excessive construction costs.[19] When President Richard Nixon assumed office in 1968 the costs of the war had escalated so much that no new nondefense domestic projects could be authorized. Between 1970 and 1985 Congress passed virtually no new authorizations or appropriations for major rivers and harbors work anywhere in the country.

Also, beginning in 1964 Congress and the administration forced the Corps to begin reducing the size of its staff. For about five years the District's Arkansas River commitments prevented its losing personnel as other Districts did. However, after it completed its portion of the Arkansas River project in 1969, the Little Rock District began to absorb its share of the cuts.[20]

When Jimmy Carter became President in 1976, reduction in civil works funding, particularly Corps of Engineers project funding, had significant ideological overtones. The administration singled out the Corps as an example of the old-fashioned pork-barrel politics-as-usual that Carter pledged to end if elected. He made his feelings on water projects clear: he opposed their funding. Carter, like an earlier professional engineer President, Herbert Hoover, was particularly interested in reorganizing and rationalizing the executive branch of government. Carter resurrected many of Hoover's ideas about the kinds of agencies that should do civil works.[21]

Under the Carter administration, in 1979 the Corps initiated a realignment study to investigate whether to redefine the roles of Districts with low work loads. By then the Little Rock District, as well as the St. Louis, Chicago, New England, Buffalo, and Albuquerque Districts, was categorized this way. The study not only attempted to determine costs and benefits of transferring some of the Little Rock District's responsibilities to the Tulsa District, but it also assessed the possibility of assigning to the Little Rock District operations and maintenance for all Corps projects within the boundaries of the state of Arkansas.[22]

ILLUSTRATION 119. Cartoon by George Fisher. Reprinted with the permission of the **Arkansas Gazette.**

ILLUSTRATION 120. Present civil works borders.

Neither occurred. The study led instead to a 1980 decision to change the boundaries of the Little Rock District. The Corps reestablished the boundary between the Little Rock and Tulsa Districts from the Missouri-Oklahoma-Kansas state lines. The new boundary between the two Districts followed the Arkansas-Oklahoma state line to the Red River. From there it proceeded eastward along the Arkansas-Texas state line to where the line turns south; thence the new boundary extended southward to where the Tulsa District-Fort Worth District boundary intersects with the Arkansas-Texas state line.

By this change the Southwestern Division made the Little Rock District responsible for the Little River basin in southwest Arkansas and other small areas in western Arkansas including certain Corps projects that the Tulsa District had constructed. The projects affected were Millwood, DeQueen, Dierks, and Gillham lakes. Congress authorized construction of these four lakes in 1958 as part of the seven-reservoir Little River flood control system, which is itself a key element in the general flood control plan for the Red River below Lake Texoma. In addition to flood control, Millwood, DeQueen, Dierks, and Gillham lakes supply municipal and industrial water.[23]

Serving as a water supply is more important at these southwestern Arkansas lakes than it is at the mountain reservoirs. Millwood Lake, for example, is the primary supplier of water to the paper mills that provide the base for the region's economic life and to Texarkana, the area's major city. Because Red River water is too salty for human consumption or industrial use, these lakes are as pivotal to the new economic prosperity of southwest Arkansas as the mountain reservoirs, with their tourists and retirees, are to the revitalized economy of northwest and north central Arkansas. All four lakes are relatively new, especially when compared to other reservoirs in the Little Rock District. The Tulsa District completed Millwood, the oldest of the four, in 1966. It completed Gillham and Dierks in 1975 but did not complete DeQueen Lake until 1977, just three years before the transfer.

Gillham would have been finished sooner had it not been the center of a major court case in 1971 and 1972 testing the adequacy of Corps of Engineers Environmental Impact Statements (EISs).[24] In 1969 Congress passed the National Environmental Policy Act. In accordance with this act the Corps is required to prepare and file a separate environmental study for each project it undertakes. After this environmental assessment is made, the District Engineer determines whether an EIS is required. If required, the EIS considers the environmental impact of the proposed action, unavoidable adverse effects to the natural and cultural heritage, alternatives to the proposed actions, the relationship between short-term use of the environment and maintenance of long-term productivity, and irreversible commitments of resources necessitated by the project's adoption.[25]

To comply with the spirit and the letter of the law,[26] Chief of Engineers Lieutenant General Frederick J. Clarke established an Environmental Advisory Board in 1970. The board composed of six nationally known environmental leaders, examined the Corps' existing and proposed policies, program, and activities and advised the Corps on ways to improve its working relations with the conservation community and general public. It provided information on environmental problems or issues pertinent to specific plans or programs.[27]

At the District level, the most obvious change was its incorporation of an environmental unit. Following general Corps-wide policy, the Little Rock District established its environmental unit

ILLUSTRATION 121. Millwood Dam before impoundment. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

in its planning branch in the late 1960s. The District initially used available personnel or contractors to perform these additional tasks. In time, when personnel spaces became available, the District expanded its own technical staff to accomplish the needed work.

By 1969 the Corps also had significant cultural resource responsibilities. In the National Historic Preservation Act of 1966 Congress built upon the Antiquities Act of 1906, the Historic Sites Act of 1935, and the Reservoir Salvage Act of 1960. The 1966 act established the Advisory Council on Historic Preservation (ACHP) and, in Section 106, ordered that federal agencies, including the Corps, give the ACHP the opportunity to comment on the effects of their projects on historic and archaeological resources. After consulting with the ACHP, the agency is responsible for deciding the ultimate disposition of the property or resource, electing to accept, modify, or ignore ACHP recommendations. Because no clear and identifiable product of this review was comparable to the EISs mandated by the National Environmental Policy Act of 1969, the Corps did little to comply with the National Historic Preservation Act of 1966 until Congress incorporated cultural resource impact review in the EIS process.[28]

In May 1971 President Nixon, through Executive Order 11593, expanded federal agency responsibilities under the National Historic Preservation Act of 1966. He specifically ordered the heads of all federal agencies by 1 July 1973 to locate, inventory, and nominate to the National Register of Historic Places all sites, buildings, districts, and objects under their jurisdiction or control that appeared to qualify for inclusion in this registry. Unfortunately, neither Congress nor the President authorized the Corps of Engineers to pay for cultural resource surveys with project funds, and the Corps had no other monies. Congress authorized the National Park Service to support surveys to locate and inventory cultural resources, and since the various federal agencies depended on the National Park Service to fund and administer their cultural resource surveys, the Park Service staff was overwhelmed. Corps Districts accomplished little toward Nixon's cultural resource goals by 1973.[29]

Congress attempted to rectify this problem by passing the Archaeology and Historic Preservation Act of 1974. By the terms of the Moss-Bennet Act, Congress authorized federal agencies to transfer up to 1 percent of the cost of federal construction projects (other than dams) to the Department of the Interior to help fund necessary cultural resource survey work. This act allows the National Park Service to develop and administer a rational program for recovering, protecting, and preserving scientific, prehistoric, historic, and archaeological data that would otherwise be damaged or destroyed through federal action.

Because most of the Little Rock District's projects were built, its cultural resource survey work received little funding. Soon after the passage of this act Congress authorized the Corps of Engineers to spend as much as $10,000 to locate cultural resources. The Little Rock District, working with the Arkansas Archaeological Survey, fully used this opportunity. In addition it arranged for contractors performing environmental impact surveys to hire subcontractors to provide archaeological surveys and inventories. Congress authorized Corps Districts to fund environmental impact surveys directly and fully.[30]

During this period of increased awareness of historic preservation, events conspired to create an unusual opportunity for District action. In October 1976 a prolonged drought exposed the wreck of a paddle-wheel steamer, the New Mattie, lost on the White River after springing a leak on 17 February 1900. The District immediately called in cultural resource specialists, and

District personnel worked with state archaeology authorities to organize a data recovery mission. After the research team removed as much information as possible, it removed the ship's capstan, which became part of a traveling history exhibit.[31]

In 1980 Congress further encouraged cultural resource work. It passed a series of amendments to the National Historic Preservation Act of 1966 waiving the project cost limit of 1 percent on recovery of cultural resource data. Executive Order 11593 also clarified federal agencies' preservation responsibilities. Since then the Little Rock District has funded various archaeological studies in Arkansas and southern Missouri. In July 1983, during a District-funded study to prepare for the Conway water supply reservoir, workers discovered evidence of the first known agricultural activity in Arkansas. Their analysis of plant remains at a prehistoric Indian village proved that agriculture was practiced in Arkansas as much as twelve hundred years ago.[32]

More recently the District used a predictive modeling approach to synthesize cultural resource data from several studies at different times into data bases for whole regions. It initiated a direct computer linkup with the Arkansas Archaeological Survey to expedite the review of permits, operations and maintenance, and real estate actions. The District uses computerized data bases in all planning projects and in managing cultural resources on Corps fee and easement lands.

In 1985 the District initiated two particularly innovative programs. Drawing upon the resources of the Corps' Geotech Laboratory at the Waterways Experiment Station in Vicksburg, Mississippi, it began a geomorphology mapping study of the Arkansas River basin. This study will identify landforms and places at Ozark and Dardanelle likely to contain archaeological sites. The District plans to follow up with site testing and long-term management studies. In 1985 the District also funded the first phase of an archaeological survey of Table Rock public use areas and shoreline likely to have archaeological remains.[33]

Though Corps regulatory, environmental, and cultural responsibilities are important, Congress does not fund them at the same level that it funds major construction projects. These duties did not protect the Corps from Carter-era budget cuts.

When Ronald Reagan assumed the presidency in 1981, the anti-Corps and anti-water-project rhetoric of the Carter years ended. Reagan's drive to reduce the size of the federal government affected Corps waterway projects. During Reagan's first term, Congress authorized no new projects and the Corps, including the Little Rock District, experienced successively lower budgets.

During the governmentwide financial crises of the past twenty years, the Corps responded with new mechanisms and strategies. It reduced its number of employees and contracted more of the work it had done itself to private enterprise. The Office of Management and Budget circular A-76, known within the bureaucracy as the contracting-out circular, encouraged this privatization, urging federal agencies to have as much work as possible done by private contractors.

During the Reagan administration, the use of these two mutually reinforcing strategies accelerated greatly. David Stockman, Reagan's first-term director of the Office of Management and Budget, argued quite persuasively that the only way to reduce the long-term federal deficit effectively was to reduce the number of federal employees. Even if the immediate costs of privatizing these employees' work were greater than these employees' salaries, the long-term savings in federal pensions would make the strategies cost-effective. As a result of this administration policy, the Corps contracted out increasingly more work, regardless of the immediate costs, thus reducing its work force.

In 1983 the Little Rock District's Mountain Home Resident Office had the equivalent of eighty full-time employees. In 1985 it had sixty-seven. To maintain the work load, the Resident Office hired contractors. At first, qualified contractors were not available in the Mountain Home area. The required road graders, gravel spreaders, and large-scale mowers were unavailable. Because of the Corps' steady demand for services, people invested in the necessary equipment and tools and formed contracting firms. By 1985 entrepreneurs had created several new businesses in the Mountain Home area. These new firms provided services that had never before been available locally.[34]

In addition to further reductions in personnel and increased privatization, successive budget cuts during Reagan's first term also led to economically motivated administrative reorganizations. In 1982 the Southwestern Division consolidated the Little Rock and Tulsa Districts' finance and accounting functions in the Tulsa office. Simultaneously, the Division realigned the Little Rock District's boundaries. After 1 July 1982 the Corps redefined the boundary between the Little Rock and Tulsa Districts as the Missouri-Oklahoma-Kansas state line. Consequently, the Little Rock District assumed responsibility for the Arkansas River drainage area in the southwestern corner of Missouri, part of the Tulsa District since before World War II.[35]

Although the Corps has not changed the civil works boundaries of the Little Rock District since 1982, Arkansas politicians again brought up the issue for congressional consideration in 1985. Making the District responsible for all Corps projects within the boundaries of the state of Arkansas was considered but discarded in 1939 and in 1979. Congress reevaluated the issue in 1985, but it left the existing civil works boundary intact. Instead, effective 1 October 1985, the Southwestern Division made the Little Rock District responsible for designing and constructing all military construction projects in the state of Arkansas. This meant that the District, simultaneously with implementing new reductions-in-force, assumed responsibility for work at Fort Chaffee, Pine Bluff Arsenal, Little Rock Air Force Base, Blytheville Air Force Base, and Camp Robinson, as well as at all Reserve centers in the state. The Little Rock District once again had a full military mission.[36]

Operations and Maintenance

In addition to its new military construction mission, in 1985 the District was responsible for operating and maintaining twelve low-head navigation dams, twelve navigation locks, more than three hundred miles of navigation channel, twelve river pools, twelve flood control dams, seven hydroelectric generating plants, and twelve reservoir lakes with nearly four hundred thousand surface acres and approximately thirty-five hundred miles of shoreline.

The District operated the navigation dams to maintain the necessary depth of water throughout the Little Rock District's portion of the McClellan-Kerr Arkansas River Navigation System. This involved passing closely monitored and regulated portions of the naturally flowing water through the dam's spillways and regulating flow releases through the dams to minimize the need for dredging the downstream channel and to help maintain navigation when dredging was required. The Little Rock District used three basic techniques to achieve the flow alteration needed for maintenance reasons.

The first technique the District used is called hinged pool operation. Hinging the pool means lowering the water surface level as much as five feet immediately upstream of a dam during periods of high flow to control where sediment from the flowing

river is deposited. The flushing action achieved minimizes the deposition of sediment in the shallow parts of the pool.[37]

The second technique, pool elevation, temporarily increases the depth of water pooled behind the dam until problem shoals can be dredged. In some of its Arkansas River navigation pools the Little Rock District generally raised the water level one foot to compensate for dredging.

The third technique used to maintain navigation depths related to the dredging season. After high flows, the water level in the McClellan-Kerr Arkansas River Navigation System sometimes recedes rapidly, making it difficult to maintain full channel depths while shoals are identified and removed. To more gradually taper flows and to provide more time to locate and perform dredging, the Little Rock District controls the release of some flood storage waters in upstream lakes to create what it calls a navigation taper.

Some District operations at the navigation dams are not routine. For example, on the evening of 4 December 1982 thirty-eight barges broke away from a fleeting area upstream from Wilbur D. Mills Dam (Number 2). Thirteen barges collided with the dam and either sank, blocking entrance to the gates, or became lodged within their openings.[38] If one gate is left open and the adjacent one is blocked, irreversible scouring could undermine and eventually destroy the dam. If the dam failed, the District could not maintain navigable depths upstream. So the Little Rock District called in the Navy.

The District coordinated and provided support and logistic services for the thirty-two-member salvage team that the Navy contracted to remove barges from the dam. During their sixty-day effort the team used deep-sea divers, a diving platform, a recompression chamber, a 60-ton crawler crane, 375- and 450-ton lift derricks, assorted heavy-duty winches, and several tugboats and barges to accomplish the $3 million job.

Except in such unusual circumstances, operation of Little Rock District navigation locks required a larger staff than did operation of navigation dams. Since the McClellan-Kerr Arkansas River Navigation System never closes, District staff must always be available to pass vessels through each lock. District staff have also consistently provided routine maintenance for locks and their movable parts since their completion in 1968 and 1969.

The locks are largely submerged, so their inspection and repair are difficult.[39] To make them fully accessible, they must be dewatered. In 1980 the District dewatered the oldest of the locks in its portion of the navigation system, Norrell Lock (Number 1). To perform the dewatering, subsequent inspection, and necessary minor repairs, the District closed the lock to traffic for about two weeks, notifying shippers and other users of the closing well in advance to allow them to make alternative plans. Beginning in 1982, every year the District scheduled two locks for dewatering, inspection, and minor repair so that a full cycle of inspection and repair would be complete by 1990. The process will then begin again at Norrell Lock.

To maintain its 308.6 miles of navigation channel, the District relies on dredging operations and maintenance of revetments and dikes that keep the channel in its desired location. The District must remove shoals in the pools. Shoals normally appear following increases in the river's flow. By 1985 most District dredging was done using contract cutterhead dredges, removing approximately two million cubic yards of material annually. A few areas require dredging each year.

The cutterhead dredges are successors to the dipper dredges and hydraulic dredges the District used in the 1880s and 1890s. By the 1920s and 1930s, as modern tough, flexible wire cables began to supersede chains in operating the buckets, the Corps increased the size of the buckets it used on these old-fashioned dredges to an average of three cubic yards.[40] By 1961 the bucket of one land-based dragline used to build waterways in the District weighed seven tons and had a scoop capacity of eleven cubic yards.[41]

Though this machine's capacity was large, it was dwarfed by the capacity of 1960s-era suction dredges. The 27-inch suction dredges that the District used on the Arkansas River could move approximately 1,500 cubic yards of material in an hour. In 1967 the Little Rock District advertised a contract for removal of 21,400,000 cubic yards of material in four months. It would have taken an 1880s dipper dredge nearly sixty years to move that much, assuming no breakdowns or delays.[42]

Although the District maintained the channel in 1985, the Coast Guard maintained navigation aids, including various channel and shoreline markers along the waterway. The Coast Guard kept especially close watch on channel marker buoys, promptly rebuoying the channel when necessary. Daily marine radio bulletins alerted waterway users to navigation conditions. At each lock the District distributed Coast Guard channel reports showing channel depths, sailing instructions, and the status of navigation aids.

In spite of the Coast Guard's activity, some District maintenance of the channel related directly to barge traffic. When, on 27 June 1982, a barge wrecked at Lock and Dam Number 4 near Pine Bluff, the towboat pushing the barge lost power, and the barge broke free and hit the gated section of the dam. The Little Rock District organized the cleanup for the 336,000-gallon oil spill, which created a twenty-six-mile-long oil slick.[43]

In addition to these McClellan-Kerr Arkansas River Navigation System operation and maintenance responsibilities, the District had significant operation and maintenance responsibilities at its flood control projects. It routinely released calculated, regulated, and monitored amounts of water from storage pools. It carefully evaluated and controlled the effect of water retention on the size of upstream pools and on shoreline development and of water release on downstream areas. It also routinely inspected and repaired the dams.

In 1984 unusually heavy and persistent rains tested all Little Rock District flood control dams. The District reported an October rainfall in Yell County, Arkansas, of more than twenty-four inches; the normal is about four. Water topped nearby Nimrod Dam's spillway in the early morning on 23 October. Nimrod Lake was then thirty feet higher than normal for that time of year. Some parks and low-lying areas around the lake had already flooded. But, even with as much as one and one-half feet of water going over the spillway, the Little Rock District controlled additional releases from the dam. Low-lying agricultural lands of the Fourche LaFave valley flooded, but Corps operation of the dam reduced the flood crest and spared further crop damage.[44]

Meanwhile, at Blue Mountain Dam in Yell County the water level rose to about a foot over the spillway. This did not happen until flows downstream on the Petit Jean River had already crested. Throughout the emergency, however, the District controlled releases at Blue Mountain and avoided major flooding.[45]

Simultaneous flooding along uncontrolled sections of the White River was extensive. There, in a cooperative effort, the Little Rock District and the Southwestern Power Administration stopped water releases from the lakes for several days to ease the situation for White River basin farmers. The District declared a flood emergency, and the power administration ceased power generation at Bull Shoals, Greers Ferry, and Norfork. However, downstream from these dams the Buffalo and Black rivers rose above flood levels, greatly increasing the flow of the White. Though

flooding was severe, it would have been much worse had the District not contained substantial amounts of water in the upstream reaches of the White River.[46]

Above-normal amounts of rain fell from October to early 1985. The rains briefly abated, but in the spring they returned with unusual severity. Between October 1984 and May 1985 the District recorded the largest volume of flood water in the White River basin since construction of the lakes. The Little Rock District's dams and lakes regulated thirteen million acre-feet of flood water. This volume is 2.4 times the volume of flood storage contained in the six District lakes in the basin. In April the lakes reached the second and third highest levels ever recorded.

To store these massive amounts of water, the District used the interrelationship it had created between the White River projects. When Beaver Lake filled to its spillway, the District released some of the lake's 9.7 billion gallons of water. This water moved northeastward into Table Rock Lake, the next project along the river's course. Because Table Rock Lake is about twice as large as Beaver Lake, its capacity is greater, and because it is also downstream from Beaver, it effectively buffered Beaver from overfilling.[47]

In January and February, when the weather permitted, the District began to lower the lake levels until they could contain the typically wet Arkansas winter and the annual spring rains. Water releases had to be gradual to protect downstream areas from flooding. In keeping with its standard policy, the District had to slow releases further in the spring to permit farmers to plant their crops. As a result, lake levels, particularly at Bull Shoals and Norfork, remained high for months, creating problems for marina operators and dock operators who wanted lower lake levels during the tourist season.[48]

Recognizing the conflict of legitimate interests among local lake users, downstream farmers, and other groups, the Little Rock District considered these specific issues in the final stages of a congressionally authorized study of how it operated its six White River dams. Using a sophisticated computer model programmed with river data gathered between 1950 and 1985, District engineers examined the consequences of changing its procedures. Completed in July 1985, the study recommended that the District practice what has been called controlled flooding. Although releasing more water during the winter would flood thousands of farming acres, the District could reduce its spring releases, allowing more farmland to be drained more quickly.[49]

While attempting to balance the interests of opposing groups, the study recognized the limitations of the Corps in satisfying recreation and tourism. Unlike the 1944 congressional authorization to provide recreational facilities at the McClellan-Kerr Arkansas River Navigation System reservoirs, Congress did not specify recreation as an official purpose of the reservoir projects. It specified only flood control and hydroelectric power generation as official purposes. The District must thus attempt to satisfy representatives of those interests first, and all efforts to satisfy recreational interests must not adversely impact downstream flood control efforts or hydroelectric power generation.

Moreover, the study found little correlation between lake levels and recreational use. High water did not decrease park visitation, state sales tax receipts, user fees, or concessionaire receipts. The study found that large fluctuations of lake levels increased expenses for dock operators and decreased the quality of recreational experiences.[50] It concluded that the District should not support a 1984 request by boat dock operators and other tourism interests to have Congress add recreation as an authorized purpose of the six White River dam and lake projects.[51]

The study found that reallocating water stored in the lakes to maintain constant levels was not economically justified. It stated that such action would adversely affect other aspects of lake management. If reallocation occurred, federal law required non-federal cost sharing. The study found no sources of such non-federal funds, and it pointed out that any major reallocation of the stored water would require congressional consent. It argued that controlled flooding would provide some limited help for recreational interests on the lakes without hurting other authorized lake operations.[52]

Following publication of this study, in 1985 the District initiated another to determine precise procedural changes necessary to implement controlled flooding. This study was expected to take about a year to complete.

In 1985 the District was also changing some of the five powerhouses at its high-reservoir dams. Contractors were converting the Bull Shoals power plant into a remote-control center for operation of hydroelectric facilities at Norfork and Greers Ferry dams. With completion of this conversion in 1987, the District reduced its staff by ten at Norfork and Greers Ferry. The District began to upgrade the facilities at Norfork and Greers Ferry to state-of-the-art systems in 1982. Although the conversion will make the three powerhouses distinctive as up-to-date facilities, they are not the first District powerhouses to be remotely controlled.

Beaver powerhouse generators were operated from Table Rock powerhouse since their introduction in the 1960s. The Ozark-Jeta Taylor powerhouse generators were operated from Dardanelle since they began operating in the mid-1970s. The Southwestern Power Administration always dispatched the power generated at the District's seven powerhouses by remote control from its Springfield, Missouri, station.[53]

ILLUSTRATION 122. Bull Shoals Powerhouse.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

Beginning with the Water Resources Development Act of 1976, hydropower issues came into focus as Congress authorized the Corps to conduct a National Hydroelectric Power Study intended to assess the national potential for hydropower capability and generation. After the energy crisis of the 1970s and advances in low-head hydroelectric power generation technology, the Corps seriously considered hydroelectric power generation at sites it would have dismissed ten years earlier.[54]

In accord with this study, in June 1979 the Senate ordered the Little Rock District to determine the feasibility of developing additional hydroelectric power on its portion of the McClellan-Kerr Arkansas River Navigation System. The District first studied Murray Lock and Dam near Little Rock, the largest urban area in the District and the largest local power user. Although Murray's maximum elevation change is only eighteen feet, the District recommended power production there utilizing special new low-head technologies.[55]

Due to federal fiscal constraints, the executive branch of the government encouraged private development of hydroelectric power at Corps dams, and by December 1982 the Federal Energy Regulatory Commission issued licenses for power plant construction at a Corps project. In 1985 private entrepreneurs began constructing a 43.75-megawatt powerhouse at Murray Lock and Dam for the city of North Little Rock. Although the District is not building this project, developers are using its design and construction criteria. District staff review and approve designs, plans, and specifications and inspect the construction.[56]

The Little Rock District's operations and maintenance mission at its reservoirs involves upkeep of public facilities and provision of recreational opportunities as well as operation of dams and power facilities. The approximately forty-four million visitors to its recreational facilities in 1985 made the Little Rock District the fourth most-visited Corps District in the continental United States and the first-ranked collector of recreational user fees.[57]

With high visitation but with staff reductions, the Little Rock District developed innovative management strategies. Its methods not only have won national recognition and awards but also have been adopted as models applied at federal, state, and local recreational facilities nationwide.

The District impounded Greers Ferry Lake in 1964 and by 1985 had developed fifteen parks with more than twelve hundred campsites on its shores. In 1985 the District recorded over 5 million visits at its Greers Ferry Lake facilities. Even by 1970 Greers Ferry parks had two million visitors annually.

District project funds and personnel were sufficient only to keep the parks clean. In the six years the lake operated, millions of visitors left tons of litter along the lake shoreline, in the lake and in the Little Red River below the dam. Carl Garner, resident engineer at Greers Ferry Lake, believed the litter had become intolerable. He and his staff, jointly with the Greers Ferry Lake and Little Red River Association, in September 1978, organized a cleanup using local volunteers to remove litter from the 300 miles of shoreline and parks and roadsides near the lake.[58]

This cleanup became an annual event, and in 1979 the Little Rock District began a cleanup program involving all of its projects in Arkansas and Missouri. Annual cleanup campaigns were and continue to be held at District lakes and many locations along the Arkansas River. Objectives of the cleanup were threefold: to remove litter, keeping the lakes and rivers clean; to involve the public, improving community relations; and to provide a continual educational program of litter prevention, promoting a greater appreciation for the environment. As these objectives were realized, two others emerged, to provide a model for other anti-litter campaigns and to institute a recycling program. This cleanup became known as the Great Arkansas Cleanup.

ILLUSTRATION 123. Great Arkansas cleanup.

(Courtesy of the U.S. Army Engineer District, Little Rock, AR)

In 1980, Richard Groves, Table Rock resident engineer, organized the Missouri Beautification Association to clean up the entire Table Rock Lake/Branson, Missouri area. This event soon mushroomed into a statewide cleanup of Missouri, which also became an annual event.

The Arkansas and Missouri cleanup programs have been models for similar programs in at least seven other states and some foreign countries. These events also inspired national legislation in 1984 creating an annual Federal Lands Cleanup Day. The Greers Ferry Cleanup and the Great Arkansas Cleanup have won several Keep America Beautiful Association awards.

The cleanup program is not the only national trend-setter in the District. The contract park attendant program began at Table Rock Lake in 1974. Created by Richard Groves, Resident Engineer at Table Rock, the program is now used nationwide at virtually all Corps of Engineers and Forest Service recreational facilities and campgrounds and at state parks and recreation areas in over twenty states. Groves knew that retired couples traveling in recreational vehicles constituted a substantial part of the camping community. He also knew that if their expenses were less, many would stay longer at their favorite campgrounds. He proposed using the talents of these couples while providing them with something they would like: a free trailer site and utilities plus a monthly salary. On a bid-basis, Groves proposed that these retired couples collect camping fees from their fellow campers, act as campground hosts by providing a friendly ear and a helping hand, and perform other duties based on an individually negotiated basis. He submitted his suggestion to the District and was awarded the title "Suggester of the Year," a cash award, and a presidential note of appreciation.[59]

When instituted on a trial basis at Table Rock in 1974, the contract park attendant program proved an unqualified success having unanticipated benefits. The presence of hosts on-site twenty-four hours a day, throughout the week effected a dramatic

ILLUSTRATION 124. The contract park attendant program had many benefits for Little Rock District campground users. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

ILLUSTRATION 125. A Nimrod Lake wildlife food plot. (Courtesy of the U.S. Army Engineer District, Little Rock, AR)

decrease in vandalism and abuse and evoked a new cooperation between campers and campground managers. Many retired couples assumed traditional park maintenance duties normally performed by District staff, improving the image of Corps campgrounds among their users.

Smaller Little Rock District facilities also developed award-winning, natural resource-related programs. Nimrod demonstrated progressive leadership in instituting an outstanding natural resource management program. Louis O.D. Kealer, Nimrod-Blue Mountain Resident Engineer, and his staff provide habitat requirements for a diverse population of native wildlife. The Arkansas Wildlife Federation, the National Wildlife Federation, and Sears, Roebuck and Company named this District facility Conservation Organization of the Year for contributions in the use and management of the nation's natural resources. The staff were also awarded the Arkansas Conservation Achievement Award in recognition of their wildlife food plots, fish attractors, wood duck nesting boxes, and bluebird nesting boxes.[60]

Unfortunately, not all recreational operations in the Little Rock District have had such satisfactory results. In June 1977 a District park ranger working at Blue Mountain Lake was shot and killed while on duty. Opal L. James and his partner, David Small, surprised two escapees from an Oklahoma state penitentiary. The convicts wounded Small and took James captive. Searchers recovered James' body several days later. He was the first and only Corps ranger in the nation slain in the line of duty. The Little Rock District honored Ranger James by dedicating one of the Blue Mountain overlooks to him and by creating the Opal L. James Memorial Scholarship at Arkansas Tech University.[61]

Many visitor-use facilities such as the Opal L. James Overlook are scattered throughout District reservoir and river parks. At three facilities the Little Rock District constructed state-of-the-art visitor center complexes. The one at Dardanelle Lake includes the resident office and an exhibit gallery. The Table Rock Resident Office and Visitor Center complex includes an auditorium, exhibit area, four-seasonal aspect display, and a nature trail. This center received the Corps' 1977 Distinguished Design Award. Equally impressive is the sixty-one hundred-square-foot Greers Ferry Visitor Center. Begun in 1981 and completed two years later, the building is designed for maximum heating and cooling efficiency. Earthen berms cover the sides of the building. To minimize summer heating, outside walls and a roof overhang shade the south glass. In winter the south glass functions in passive solar heating. The building also includes active solar heating units.[62] According to one analyst, while other Southwestern Division projects have visitors centers, few have exhibits that compare to those at Table Rock and Greers Ferry.[63]

Services for Others

In addition to operating its own sites, the Little Rock District has significant responsibilities in the community at large. In 1972 Congress authorized the Corps to initiate a dam safety program. Initially the Little Rock District compiled an inventory of all structures included in the program. In June 1976, when the Bureau of Reclamation's Teton Dam in Idaho collapsed, nine people were killed and thirty thousand were left homeless. Seventeen months later, in November 1977, a flood caused a private dam to collapse in Toccoa, Georgia, and 39 people died. President Carter freed federal funds for inspection of nonfederal dams and called on the Corps to inspect dams nationwide. Little Rock District inspections in Arkansas began in 1978.[64]

As a result of a now-amended 1955 act, Congress also authorized the Corps to provide natural disaster and federal emergency relief assistance service. Under provisions of this act, the Little Rock District responded with work crews and equipment to clean up tornado damage in Harrison, Arkansas, in 1973; in Cabot,

Arkansas, in 1976; and in Prattsville and Little Rock, Arkansas, in 1982. The District also provided flood-fighting and relief services early in 1973 as well as in 1974 and in December 1982.[65]

Since 1969 the Corps, including the Little Rock District, has accepted new, not necessarily water-related missions. Even in the immediate post-Civil War days, Corps-built structures ranged from the Washington Monument and the Library of Congress to bridges and roads in the national parks. As the largest and oldest engineering organization in the world, the Corps worked on many kinds of projects, not just water-related ones. The Chief of Engineers' office initiated general planning, design, and construction management programs.

Based on the Economies Act of 1932 and on presidential letters of 1942 developed to enable the Corps of Engineers to supervise Works Projects Administration operations, the Corps is authorized to provide reimbursable services for other federal agencies. In 1965, with Section 219 of the rivers and harbors act of that year, and in 1968, with the Intergovernmental Cooperation Act, Congress authorized the Corps to perform fee-based engineering and design work for state and local authorities.[66] In addition, the Office of Management and Budget's contracting-out circular urged consolidation of federal agencies to avoid intergovernmental redundancies. To comply with this policy, agencies with only periodic construction programs or special construction projects should avoid establishing construction planning, design, and oversight staffs of their own. Rather, they should utilize existing Corps of Engineers staff on a reimbursable basis.

For about twenty years, while carrying out its civil and military missions, the Corps initiated a series of national-level programs to assist other federal agencies, state and local entities, and foreign governments in achieving their objectives. For example, the Corps of Engineers performed flood insurance studies for the Federal Emergency Management Agency. The Corps designed, and in some cases oversaw construction of, the manned spacecraft center for the National Aeronautics and Space Administration (NASA), federal prisons for the Justice Department, mail-handling facilities for the Postal Service, and hospitals for the Veterans Administration. The Corps managed the Environmental Protection Agency's (EPA's) waste-water treatment facilities construction grants program. Since 1979 the Corps has committed an annual effort of about five hundred man-years to the EPA alone. The Corps also has standing agreements for design, construction management, and real estate services with NASA, EPA, and the National Park Service, among others. In many cases the Little Rock District provided these services in the area of its jurisdiction.[67]

Under the Reagan administration, interagency efforts intensified. Beginning in late 1984, the Corps decentralized responsibility for initiating and implementing such support-for-others efforts. Individual Corps of Engineers Districts are now fully responsible for marketing their construction planning, design, and management services, as well as their diverse engineering, environmental, real estate, and associated services. Individual Districts are now responsible for executing any contracts they secure. Despite this autonomy, Districts may call upon the Corps' full resources, should they be needed.

Future Opportunities

The Little Rock District's future in providing service to major Army commands has been improved by recent resumption of a full military mission in Arkansas. If the current trend to privatize much of the Corps' civil mission continues, the relative importance of military construction will increase in all Corps Districts throughout the nation. Although concerns have been generated by the periodic Corps-wide reductions-in-force characteristic of government operations since 1965 and the concurrent administrative reorganizations, Corps willingness to assume more missions not related to water resources indicates a boundless future.

The 1980s situation resembles that in the 1930s. As the reactivated Little Rock District prepared to mark its fiftieth anniversary, the floods that plagued the Arkansas and White river basins for generations are no longer so dramatic. Just as the Flood Control Act of 1936 provided the structure for the Corps to expand its services, Congress can do the same for the Little Rock District at any time. The next 50 years can be just as eventful for the Army Engineers in the Little Rock District as the past 165 years have been.

Chapter X

Conclusion

In the future it seems likely that the District will remain a barometer of the Corp's fortunes and trends much as it has been for the past 165 years. The history of Army Engineers in Arkansas and southern Missouri reflects the history of Army Engineers nationally. Starting with Stephen Long's 1819 expedition, events in the area have strikingly mirrored national patterns. The Long expedition exemplified primary responsibilities of the Corps at the time: explore and map the trans-Mississippi West and support military units in the trans-Mississippi West and on America's international borders. Later, in the 1820s and 1830s, when Corps duties expanded nationally, Corps Engineers began building roads and improving rivers in Arkansas and southern Missouri. Waterway improvement, not road building, became the predominant focus of Army Engineer activity in Arkansas and southern Missouri, just as happened nationwide. When waterway improvement activity decreased nationally in the 1840s and 1850s, it decreased proportionally in this region.

Between 1861 and 1865 the primary mission of military engineers from the North and South, including those in Arkansas and southern Missouri, was combat. As the Corps of Engineers became more active in civil works in the postwar years, it became more active in Arkansas and southern Missouri. In the late 1870s and early 1880s, when it became national policy for the Corps to begin building more internal improvements in the South, Corps involvement in the Mississippi River drainage area increased, and the Corps began using more construction-oriented river improvement methods. Corps internal improvement activity in the Little Rock District region also increased dramatically with construction of contraction and stabilization works. Captain Handbury opened the first permanent Corps office in Little Rock in this period. In the 1890s, when railroads prevailed over rivers in the trans-Mississippi West and in the East and the Corps moved from experimentation with slack-water navigation to substantial use of that system of river improvement, Captain Taber shifted the District's emphasis from the Arkansas River to the White River, where the Corps decided to build a system of locks and dams.

As the Corps came increasingly to embody the progressive spirit of professionalization and depoliticization of decision making, while at the same time the multipurpose water resource management movement grew in the early twentieth century, Corps' fortunes suffered a decline. Work in the Little Rock District simultaneously declined. By 1921, when the Chief of Engineers discontinued the Little Rock District, the Corps nearly lost its civil works mission altogether, and its military functions were tightly restricted. In the late 1920s and the 1930s the Corps changed its philosophical and engineering position on many issues. The reactivation of the Little Rock District in 1937 to build upstream dams and reservoirs for flood control and hydroelectric power generation not only reflected this change in philosophy, it also foreshadowed the dramatic 1938 upturn in the Corps' national fortunes. Once reactivated, the size of the District's work load reflected the magnitude of the Corps' new nationwide responsibilities.

During World War II the District's preoccupation with war-related tasks mirrored the nation's. The McClellan-Kerr Arkansas River Navigation System is one of a series of Corps-built projects across the country transforming important waterways into water stairways. It reflects Corps acceptance of the multipurpose water resource management philosophy prevalent in the postwar period.

In the 1960s the Corps as a whole was hard pressed to retain its work load and staff levels. The Corps' waning position was not apparent for a number of years in the Little Rock District. Work on the McClellan-Kerr Arkansas River Navigation System allowed the District to escape the effects of this downturn for a number of years. Only after 1970 did Little Rock begin to experience lower budgets, privatization, and a reduced staff. As with most other Districts, Little Rock's primary responsibilities became operations, maintenance, and regulation.

The District's 1985 resumption of a full military mission in Arkansas appears to foreshadow increased emphasis on military construction for the Corps as a whole.

More important for people of the region, the U.S. Army Corps of Engineers had an enormous social and economic impact on much of Arkansas and southern Missouri. This impact was more subtle and less observable before the construction of upstream dams and reservoirs, but by improving waterway transportation and providing jobs, the early Engineers and the first Little Rock District's activities bettered life in the region.

Since the reservoirs and the McClellan-Kerr Arkansas River Navigation System project, the District has become a most important economic and social agent in the region. Construction and staff payrolls, flood control, easily accessible power, good water for people and industry, enormous recreational and retire-

ment opportunities, massive military installations, and a sophisticated and modern transportation facility in the heart of the region transformed Arkansas and southern Missouri in the last fifty years. The population of the region will surely look to the Little Rock District to continue as one of the most active development forces in Arkansas and southern Missouri.

Appendix I

The Military Leadership

In August 1985, of the 1,157 individuals employed in the Little Rock District, only 3 were Army officers and none were enlisted men.[1] Yet ultimate leadership responsibility in the District, as in the Corps, rested, as in 1881, with the military officers. In August 1985 two Corps military officers—Colonel Robert W. "Wayne" Whitehead, District Engineer, and Major Jerome B. Sidio, Deputy District Engineer—commanded the entire Little Rock staff.

The Corps of Engineers has made notable efforts since its inception to recruit the finest officers available. Historically that meant almost exclusive recruiting of top West Point graduates. Every Little Rock officer in charge or District Engineer from 1881 until 1942 was a graduate of the U.S. Military Academy, except when a civilian commanded the District during World War I because all available trained officers were transferred to combat-related activities. In 1910 Congress authorized the Corps of Engineers to recruit civilian engineers from the most distinguished non-federal engineering colleges and universities if too few officers were available from West Point. The Corps took full advantage of this option. Of twenty District Engineers who served the Little River District between 1942 and 1985, twelve were graduates of the U.S. Military Academy and eight earned their undergraduate degrees at other institutions.

The Corps of Engineers has always attracted many West Point graduates, and has consistently enlisted many of the highest-ranking members of each class. In the early years of the modern Corps and the U.S. Military Academy this attraction was understandable. It was built into both institutions: the main objective of the 1802 legislation creating the modern Corps of Engineers was to "constitute a military academy" at West Point.[2] This institutional link aside, West Point was the leading engineering school in the United States. Consequently, it was the logical primary source, containing the only sizeable group of trained engineers in the country for recruitment.[3] Even after 1866 when Congress reassigned control of the Academy to the Army at large, all West Pointers continued to take the same curriculum.[4] As befits an institution granting the bachelor of science degree, the curriculum contains a reasonable component of the liberal arts, but it is predominantly a science, mathematics, and engineering curriculum.

All West Point graduates are commissioned into one of the Army's functional branches. Each year quotas are set up for each branch. The percentage of the cadets in each class allowed to enter each branch is based on the relative size of the particular branch to the Army as a whole. The Infantry is the largest branch of the Army, so the largest number of graduates in each class become Infantry officers. The Corps of Engineers is a relatively small branch, and fewer graduates are commissioned into it.

Assignments of cadets to branches are made, whenever possible, on the basis of student preference, with the highest academically ranked students in each class selecting their preferred branch of service. Frequently a large number of the highest-ranking students—those with an affinity for science, math, and engineering—select the Corps of Engineers.[5] The natural tendency of these academically oriented students to select the Corps was enhanced by an official Corps policy made effective after World War I. Each officer joining the Corps, regardless of the academic program leading to his undergraduate degree, was required to secure a second degree in engineering.[6] For many years the Corps provided all officers recruited with the opportunity to secure this degree at Corps expense and on Corps time. For West Point graduates, this meant that the Corps offered them the opportunity to continue their education and pursue a master's degree, sometimes immediately after basic branch training. The Corps still requires a second engineering degree for some assignments; however, now the Corps provides degree training opportunities to recruited officers on a competitive basis.[7] Because the best qualified officers get degree opportunities, West Pointers stand a good chance in such competitions. Since the Corps' West Point quota is small and many of the top students desire appointments to the Corps, its quota is usually filled early in the branch selection process.[8] Therefore, the Corps of Engineers receives a large percentage of high-ranking graduates of the Military Academy.

Throughout its history the District has been, and remains, the principal focus for the planning, construction, and operation of the Corps of Engineers' civil works activities. The District is often called the workhorse of the Corps.[9] As then acting director of civil works at the Corps' headquarters in Washington, and former Little Rock District Engineer, Brigadier General C. Ernest Edgar III said in 1985, "Being District Engineer is the best job in the Army that an Engineer officer could have. It is the preeminent job. Even if you get promoted, there is nothing like being a District Engineer insofar as having responsibility and the authority that goes with it, having the latitude to work and the opportunity to plow new ground with a full measure of authority."[10] Edgar's

sentiments echo those of Major General Harry Taylor, Chief of Engineers, who wrote in 1925, "Probably no field offices of any federal bureau have a greater degree of autonomy than the Engineer Districts."[11] Despite this autonomy, District Engineers are insulated from some of the stresses emerging from the consequences of their decisions because responsibility in the Corps of Engineers extends up the chain of command. The hierarchal chain of command also allows the District Engineer to call quickly and easily upon the full resources of the military and the resources of other Districts in times of natural or man-made disasters.

Despite the scope of the District Engineer's job, District Engineers have frequently had to wear two hats, serving concurrently as commander of more than one District or of a military unit in addition to their civil works and military construction responsibilities. For example, the five Little Rock District Engineers who served from 1906 until 1915 were serving concurrently as Memphis District Engineers. Because the Little Rock District was discontinued in 1921 and its functions were transferred to the Memphis District until the Little Rock District was reactivated in 1937, Memphis District Engineers from 1921 to 1937 are considered in the Little Rock command sequence presented here.

Individual biographical sketches of officers in charge/District Engineers appear in the following pages. These sketches of the men and their interests, abilities, dedication, knowledge, visions, and personalities significantly enhance our understanding of the Little Rock District and the Corps of Engineers as a whole. Their careers and times are interesting in a purely biographical sense. Many attained further prominence after leaving their Little Rock/Memphis post. Two became Chief of Engineers: Lieutenant General Edward M. Markham during the Great Depression, and Lieutenant General Eugene Reybold during World War II. Others distinguished themselves in combat-related roles: Colonel Brehon B. Somervell, a Little Rock native, became a four-star general for his services in World War II.

Captain T.H. Handbury

Born in Brownsville, Pennsylvania, on 15 October 1841, Captain Thomas Henry Handbury was forty years old when he assumed responsibilities as officer in charge for Corps of Engineers projects in the geographic area that would become the Little Rock District.[12]

Handbury studied law in West Virginia before receiving an appointment to the U.S. Military Academy. Immediately after graduation in 1865 he was assigned to duty at Alcatraz Island, San Francisco Harbor, where he remained until transferring to the Corps of Engineers on 2 June 1866. During his six years in San Francisco he served as assistant engineer in construction of harbor defenses. During this tour he was promoted to captain.

Handbury's next assignment was to serve as associate professor of engineering at West Point until 1876. He next went to Willet's Point, New York, to command a company in the Battalion of Engineers. After two years he transferred to St. Louis. He served as assistant engineer from 1878 to 1880 when the St. Louis office was responsible for improving the Arkansas River, the most important river in the Little Rock District.

Handbury's subsequent tour as District Engineer in Little Rock lasted two years, from 1881 to 1883. His primary duties were establishing a permanent Engineer office in Little Rock, supervising snagging operations, working on a major construction project at Pine Bluff, and surveying several rivers in Arkansas and southern Missouri.

From 1884 to 1888, Major Handbury managed various rivers and harbors improvements and surveys in Illinois. In April 1888, he became superintending engineer of rivers and harbors improvements in Oregon and Washington, a position he held until 1893. During this period he served as a member of the board of officers reporting on mining debris in California. While serving as engineer for the 13th Lighthouse District, he erected a first-order light on the coast of Washington.

When Handbury left Oregon, he was appointed superintending engineer for improvement of navigation in Louisville and later in Florida. Two years later he was assigned to superintend improvement of the Mississippi River from the mouth of the Missouri River to the mouth of the Ohio. From 1896 to 1901 he served on the Mississippi and Missouri River Commissions.

From 1896 to 1899 Handbury simultaneously served as District Engineer for the St. Louis District. In 1902 he returned to the West Coast where he managed construction of defenses at San Francisco harbor until he retired in October 1905.

In retirement Handbury and his wife traveled to Japan, later deciding to live there. In 1911 they moved to China, where they remained for a year before journeying across Russia and Europe to settle in Vevey, Switzerland, for the next four years, until the colonel's death on 20 August 1915.

Major M.B. Adams

Milton B. Adams was born in Pennsylvania in 1845 and was appointed to the U.S. Military Academy from Salena, Ohio, in June 1861. The Civil War was ending when Adams, a classmate of Thomas Handbury, graduated from West Point in 1865.[13]

Upon graduation Adams received his commission into the Corps of Engineers. From 1866 to 1868 he was an assistant professor of engineering at West Point. He later directed fortification work along the Atlantic coast and waterway improvement in several southern and western states.

Major Adams was thirty-eight years old and eighteen years out of West Point when he assumed command of the Little Rock District Engineer office on 11 December 1883. His responsibilities as officer in charge for projects in the geographic region lasted only seven months, from December 1883 to July 1884. During this period he directed surveys and improvements on the Arkansas River and many of its tributaries, among other projects.

Various assignments followed for Adams. He directed waterway improvements in the Tennessee and Cumberland rivers area and was engaged in river improvements in the Great Lakes region. He also served briefly at Detroit on lighthouse duty.

Colonel Adams died in Sharon, Pennsylvania, on 21 June 1909.

Captain H.S. Taber

A graduate of the U.S. Military Academy, class of 1873, Henry S. Taber was born in Easton, New York, on 30 July 1850. At the age of thirty-four he assumed officer-in-charge responsibilities for Corps of Engineers projects in a geographic area that would later become the Little Rock District.[14]

Taber's career with the Corps began when he graduated from West Point. His first assignment was Willet's Point, New York; he served later at West Point with the Battalion of Engineers from 1873 to 1882. While at West Point he supervised post schools, with much time spent on the spiritual welfare of children. From 1882 to 1884 he served as Engineer officer of the Department of Dakota.

Eleven years after graduation from West Point, Taber was commander of the Little Rock District Engineer office. This assignment lasted nine and a half years, from 1884 to 1893. Taber's responsibilities included maintenance, surveying, and improvement of the rivers. During this period public and commercial demands for better navigation and flood control on the

Arkansas and White rivers grew. Taber was active in promoting rivers and harbors improvements in the river basin areas. Under his command the Little Rock District became firmly established. Henceforth, all political and commercial demands for river improvements in the Arkansas region required federal government action.

Captain Taber remained active, despite criticisms that he was not doing enough to aid river improvement, until ill health forced him to seek and later obtain a leave of absence from the Army. Lack of physical strength, however, prevented his recovery. He died in San Antonio, Texas, on 12 April 1894.

Captain C.F. Palfrey

Born in Barnstable, Massachusetts, on 4 July 1846, Carl Follen Palfrey was appointed to the U.S. Military Academy from Maine. He was a forty-seven-year-old captain, twenty-three years out of West Point, when he assumed command of the newly designated Little Rock District on 19 December 1893.[15]

When Palfrey graduated from West Point in 1870, he was immediately commissioned into the Artillery. Two years later he transferred to the Corps of Engineers.

For five years, 1873 to 1878, Palfrey taught mathematics at West Point. He served two years at the Presidio, San Francisco, California, and worked on military transportation from Fort Apache to Camp Thomas. He also had rivers and harbors duty at Milwaukee, Wisconsin; Grand Rapids, Michigan; St. Louis, Missouri; and Oswego, New York; and served as secretary to the Mississippi River Commission while at St. Louis. Before being assigned to Milwaukee in 1883 he was promoted to captain.

Palfrey's duty as Little Rock District Engineer lasted less than a year, 1893 to 1894. Filling the vacancy left by Taber, Captain Palfrey continued his predecessor's efforts by advocating improvements for the Arkansas and White rivers. He supported the call for maintenance of a five-foot channel upstream from Little Rock, but because his tour was so short, little action was taken on the recommendation.

Like Taber, Palfrey was plagued with poor health. Encumbered by his ailments, he was forced to retire early in 1895. He moved to Denver, then to Mexico in search of a suitable climate. While in Mexico he taught English at the Municipal University of Queretaro for two years. He settled in Redlands, California, in 1906 and died there on 17 October 1920, the 55th anniversary of his entrance into West Point.

First Lieutenant W.L. Sibert

William Luther Sibert was born in Alabama on 12 October 1860. At age twenty, while attending the University of Alabama, he received an appointment to the U.S. Military Academy.[16]

Upon graduation from West Point in 1884, Sibert was commissioned into the Corps of Engineers and assigned to the School of Application at Willet's Point, New York. Graduating in 1887, the young lieutenant became assistant engineer to Major D.W. Lockwood, then commanding the 2d Cincinnati River and Harbor District.

Sibert was responsible for the Green and Barren rivers in Kentucky. After remodeling and repairing the lock and dam system on the Kentucky rivers, he went to Detroit to begin work on the twenty- and twenty-one-foot channel connecting the waters of the Great Lakes.

At age thirty-four, ten years out of West Point, Sibert became Little Rock District Engineer. His tour was from 1894 to 1898; he was the only first lieutenant to be given sole charge of an independent command in this period. During his tour in the District he submitted various reports on the regulation and control of water flow in a twenty-mile reach of the Arkansas River north of Little Rock. His conclusions indicated the practicality of preventing erosion and detailed ways to control the water's flow from one bend to another. His recommendations were not realized because Congress determined that at low water the Arkansas would not accommodate adequate navigation to justify the expense. He developed the proposal for the lock and dam system on the White River which Congress authorized, and three structures were built by the Little Rock District.

After concluding his tour of duty in the Little Rock District, Sibert returned to the School of Application at Willet's Point as an instructor of civil engineering. He became captain and transferred to the Philippines immediately after the American occupation. During his first assignment of inspecting work on the Manila & Dagupan Railway he became chief engineer of the VIII Army Corps and, in consequence, chief engineer of the Department of the Pacific.

After completing this work in the Philippines, Sibert returned to the United States to do rivers and harbors duty at Louisville, Kentucky. The next year he transferred to Pittsburgh where he directed operations on the Allegheny and Monongahela rivers. During his tour at Pittsburgh, he received appointment to the Isthmian Canal Commission. As a result of this work on the Panama Canal, Congress thanked him in 1915, promoting him to brigadier general.

Sibert's next assignment was in a Red Cross mission to China. While there, he and other board members devised plans for flood control. The board's recommendations were not realized: the United States entered World War I in 1917.

During the war General Sibert commanded the 1st Division in France. After this brief stint he returned to the United States and directed the Chemical Warfare Service, for which he received the Distinguished Service Medal.

After Sibert retired in 1920, his home state of Alabama called on him to rehabilitate and increase dock and waterway facilities at Mobile. Sibert served as one of the engineers and later the chairman for the 1928 Department of the Interior examination of the proposed dam site on the Colorado River.

After a successful career, General Sibert died on 16 October 1936 in Bowling Green, Kentucky.

Captain H.C. Newcomer

Captain Henry Clay Newcomer was thirty-seven years old and twelve years out of West Point when he assumed command of the Little Rock District on 14 September 1898. Commissioned into the Corps of Engineers upon graduation from West Point in 1886, he served as District Engineer for only six months, until 3 March 1899.[17]

This was a critical period for the Little Rock District. These few months included the final congressional debates on bills and resolutions incorporated in the Rivers and Harbors Act of (March) 1899. This act authorized the first permanent navigation improvements, in the form of locks and dams, to be built by the Little Rock District. Ten fixed dams with concrete locks were to be located on the White River between Batesville and Buffalo Shoals. As District Engineer, Newcomer was a prominent advocate for projects in his District during the congressional decision-making process.

Other tours of duty for Newcomer included his service as instructor and assistant professor at West Point (1892-1896); with the Office of the Chief of Engineers (1916-1919), when he was first assigned to rivers and harbors duty and, after promotion to brigadier general in 1918, as director of the civil works section.

He retired from active duty in 1925.

Newcomer was born in Pennsylvania on 3 April 1861 and died in Washington, D.C., on 3 December 1935. His appointment to the U.S. Military Academy came from Illinois.

Lieutenant Robert McGregor

Lieutenant Robert McGregor was thirty-five years old and ten years out of West Point when he assumed command of the Little Rock District on 3 March 1899. Born in Algonac, Michigan, he attended the University of Michigan before his appointment to the U.S. Military Academy on 14 June 1885.[18]

Immediately after graduation from West Point in 1889 McGregor was commissioned into the Corps of Engineers. His early Corps assignments included construction of fortifications, rivers and harbors improvement, and service on several boards of engineers.

McGregor was Little Rock District Engineer from 1899 to 1901. During his assignment he recognized the need for increased activity on many river improvement projects on the Arkansas River. However, Congress was not appropriating enough funds for this work and little was done. All Corps activities during this period consisted of routine snagging and dredging operations on the Arkansas and White rivers, while planning and land acquisition continued on the White River locks and dams project. One exception was the installation of water gauges on the Arkansas and several of its tributaries.

After his tour in the Little Rock District, McGregor went to the Philippines where he served for two years as sanitary engineer of the Civil Commission and as engineer for the city of Manila. While in this capacity, he suddenly died of acute appendicitis on 23 December 1902.

Captain C.L. Potter

Charles L. Potter was born in Lisbon Falls, Maine, on 24 January 1864. He entered the U.S. Military Academy in 1882 and graduated in 1886. He received his commission as a second lieutenant, and was assigned to the 5th Cavalry.[19]

While serving with the Cavalry, Potter was assigned to frontier duty at Fort Supply in the Indian Territory. He was later garrisoned at Fort Leavenworth, Kansas, until February 1887 when he transferred to the Corps of Engineers. His first assignment was at the Engineer School of Application at Willet's Point, New York. After graduating in 1889, he went to Montgomery, Alabama, where he served as assistant to the Engineer officer in charge of rivers and harbors improvements in Alabama, Georgia, and Florida.

When the Spanish-American War began, Potter was assigned chief engineer of the VIII Army Corps in the Philippines. His other wartime service included duty in Washington, D.C., as director of gas service.

During Potter's rivers and harbors duty he displayed his engineering talents. His rivers and harbors assignments between 1889 and 1928 included tours on rivers in southern California (1889-1897); along the Mississippi at Memphis, St. Louis, and St. Paul; and at Portland, Boston, and San Francisco. In 1901, at age thirty-seven, Potter served briefly as Little Rock District Engineer.

Aside from routine snagging and dredging operations in the Little Rock District, Potter's brief tenure was spent in the preliminary design and construction phase of the White River locks and dams projects.

Potter's vast experience in rivers and harbors improvements led him to be named Southwest Division Engineer, a position he held from 1920 to 1928. When, in 1927, a disastrous flood hit the lower Mississippi valley, he produced a comprehensive plan for flood control. As president of the Mississippi River Commission, he appeared before various committees of Congress hoping to convince them of the need for such planning. His efforts were only partially realized: national attention was not on waterway development.

The strain of his work during the flood of 1927 forced Potter as a brigadier general to retire on 24 January 1928. Several months later he was recalled to active service as president of the Mississippi River Commission. As quickly as he was recalled, he was relieved on 15 May 1928. Shortly thereafter he underwent surgery, but died on 6 August 1928 in St. Louis, Missouri.

Captain G.D. Fitch

Born in Chicago, Illinois, on 17 February 1860 and educated in Germany and France, Graham Denby Fitch received his appointment to the U.S. Military Academy in 1878. After graduation in 1882 he was commissioned into an Artillery unit but soon transferred to the Corps of Engineers.

Fitch served as assistant engineer on various rivers and harbors improvement projects and was promoted to captain in 1895.[20] He was ordered to the Mississippi valley where he managed river improvements on the Mississippi River from Cairo to the White River. He earned a commendation for his work.

Captain Fitch was forty-one years old and nineteen years out of West Point when he began his subsequent tour of duty as Little Rock District Engineer on 27 April 1901. During his five-year command the District lacked congressional appropriations, compelling him in 1902 to halt all snagging and dredging operations on the White River. That same year effects of the drought that had plagued the region since early 1901 peaked. The financial disaster incurred by this drought spurred Congress to appropriate funds for full-time snagging operations.

Fitch's primary task while at Little Rock was to oversee construction of Locks and Dams Numbers 1, 2, and 3 on the White River. These projects were so expensive that little else was accomplished during his tour of duty. In 1903 he recommended that no further structures be completed in this system beyond Lock and Dam Number 3. Congress concurred, and the project was abandoned when Lock and Dam Number 3 was completed.

In his final months as District Engineer Fitch was plagued with criticism of his efforts. Railroad and river improvement associations asked Congress to recall or transfer Fitch, accusing him of not recommending enough improvements for the Arkansas and White rivers. Despite indications of support from General Mackenzie, Chief of Engineers, Fitch was transferred to the Great Lakes in July 1906.

He was assigned to rivers and harbors duty on Lake Superior for the next five years. While stationed there, Colonel Fitch, a scholar interested in mathematics and physics, won a *Scientific American* competition with the paper "The Fourth Dimension Simply Explained," later published as a book. After retiring from the Army in 1912, he was recalled to active duty for a brief time during World War I. He died in Washington, D.C., on 5 April 1932.

Captain W.D. Connor

Appointed to the U.S. Military Academy from Iowa, William D. Connor graduated in 1897. His first tour of duty, after being commissioned into the Corps of Engineers, was a combat assignment in the Philippines. For service there he was awarded a Silver Star.[21]

When Captain Connor assumed command of the Little Rock District on 14 July 1906, he had been out of West Point for nine

years and was thirty-two years old. During his tour of just over two years he served concurrently as Memphis District Engineer. Outspoken public criticism of Corps activities in the Little Rock District was evident when he assumed command of the District.

River traffic in the Little Rock District was declining, and railroad service was rapidly expanding. Despite pressure from local groups and river improvement associations, federal funding for waterway improvements was not forthcoming. When Connor left the District on 31 October 1908, no new river improvement projects had been approved during his tenure, and Corps activity in the region was diminishing.

Connor entered the Army War College as a student. He commanded the Engineer Battalion and the Engineer School before returning to the War College as assistant commandant.

With the outbreak of World War I, Connor was in the Philippines when he was summoned for General Staff duty with the American Expeditionary Forces (AEF). In 1918, after serving as chief of staff for the 32d Division, he received a temporary promotion to brigadier general and assignment to command the 63d Infantry Brigade. For his service with the AEF he was awarded the Distinguished Service Medal and another Silver Star.

After the war Connor served as commanding general of Services and Supply (1919) and of American Forces in France (1919-1920). In 1920 he was permanently promoted to brigadier general. Subsequent tours of duty included commanding general of the Army Air Forces in China (1923-1926), commandant of the Army War College (1927-1932), and superintendent of the U.S. Military Academy at West Point (1932-1938).

Connor, who became a major general in 1925, retired in 1938 but returned to active duty (1941-1942) during World War II.

William D. Connor, born in Newark, Wisconsin, on 22 February 1874, died at Walter Reed Army Hospital on 16 June 1960.

Captain G.R. Lukesh

A 1900 West Point graduate, Gustave Rudolph Lukesh was born in Akron, Ohio, on 29 August 1878. At age thirty he assumed command of the Little Rock District on 31 October 1908.[22]

Lukesh was assigned to the Corps of Engineers upon graduation and served at the Engineer School and then at Fort Totten, New York. This was followed by a brief tour of rivers and harbors duty at Montgomery, Alabama, before going to the Philippines. After two years he returned to the United States to serve in the Boston Engineer District and later served as secretary of the Mississippi River Commission before assuming command of the Little Rock and Memphis Districts. He held the command for only a brief period—less than six weeks—from 31 October until 7 December 1908.

From 1909 to 1914 Lukesh was assigned to duty with various troop units in the United States. In 1912 he again served in the Philippines where he later commanded the 3d Battalion of Engineers.

During World War I Lukesh served overseas with the American Expeditionary Forces. In 1918 he was assigned to the War Plans Division of the General Staff. At the end of the war he commanded the new 73d Engineers.

Following the war Lukesh returned to rivers and harbors duty with the permanent rank of major. He first served as Engineer of the Charleston District in South Carolina and then at Louisville, Kentucky, as District Engineer. While at Louisville he directed lock and dam construction for the Ohio River Canalization Project—the world's largest rivers and harbors project at the time. He supervised training of reserve engineers in his area and was a member of the Mississippi River Commission. In 1925 he assumed duties as Division Engineer of the Corps' Pacific Division; in 1927 he transferred to Portland, Oregon, as Division Engineer of the Pacific Division and District Engineer of the Portland District. His next assignment was as District Engineer in New York City from 1931 to 1935.

Lukesh retired on disability as a colonel in 1938 when he was sixty years old. He returned to active duty, however, for World War II, serving from 1941 until 1942. He died on 7 November 1949 in Pasadena, California.

Major M.L. Walker

Immediately upon graduation from West Point in 1893, Meriwether Lewis Walker was commissioned into the Corps of Engineers. Born in Lynchburg, Virginia, on 30 September 1869, he was appointed to the U.S. Military Academy from that state in 1889. His early service, as with most Engineers, included both civil and military duties throughout the United States.[23]

Walker's tour of duty as concurrent Little Rock and Memphis District Engineer came when he was fifteen years out of West Point, from 1908 to 1910. During this period Corps activities in the Little Rock District remained a low priority as river commerce continued to decline. Lack of funds limited his efforts in the District to snagging and dredging operations despite severe bank erosion occurring along the Arkansas River and many of its tributaries.

During his career, which lasted until 1933, Walker served in all three of the then battalions of Engineers. He served as commander of Fort Mason, California, during the earthquake and fire; member of the Board of Defense of Manila and the Philippine Fortification Board; instructor and director of the Army Field Engineer School; professor at West Point; engineer of the Mexican Expedition; instructor for the General Staff College; commandant of the Engineer School; and, at retirement, commander of the 18th Brigade. During World War I Walker became brigadier general while serving in a variety of posts such as commander of the Engineer Officers Training Camp and the 117th Engineers; Division Engineer for the 41st Division; assistant to the Chief Engineer, American Expeditionary Forces; and director of the Motor Transport Corps in France.

Walker's civil engineering activities, conducted at intervals with his more traditional military command duties, were primarily concerned with rivers and harbors work. He served as engineer of maintenance, as acting governor, and as governor of the Panama Canal Zone.

General Walker, who received a Distinguished Service Medal during World War I, remained active after his retirement in 1933. During World War II he chaired ration committees and bond campaigns and was involved in various Red Cross activities.

Walker died on 29 July 1947 at home in Martha's Vineyard, Massachusetts.

Major C.S. Smith

Clark Stull Smith was born in Illinois on 9 January 1877. A graduate of the U.S. Military Academy's class of 1898, he was commissioned into the Corps of Engineers during the Spanish-American War. In 1906 and 1907 he served with the Cuban Pacification force.[24]

Smith was thirty-four years old and twelve years out of West Point when he assumed concurrent command of the Little Rock and Memphis districts. His tour lasted just less than two years, from 19 September 1910 until 30 August 1912. During this period river traffic within the Little Rock District was very light and continued to decline. No new river improvement projects were

authorized for the District during his tenure, and Corps activity in the area was minimal. Projects to protect private property were begun during this time: the Little Rock Packet Company created a construction company to deepen and straighten channels of the Arkansas River and protect its banks.

During World War I Smith served overseas, assigned to the 86th Engineering Division of the American Expeditionary Forces.

Smith retired as a colonel in 1924. He died on 5 November 1971 in Santa Monica, California.

Major E.M. Markham

Born in New York on 6 July 1877, Edward Murphy Markham graduated from the U.S. Military Academy in 1899 and was commissioned into the Corps of Engineers. Markham's first assignment was at Fort Totten, New York, followed by a brief tour in Florida where he worked on coastal fortifications.[25]

In 1902 Markham was in the Philippines and involved in the construction of Fort McKinley. Later he led an investigation of coal deposits throughout the island chain. In 1904 he returned to the United States and served with the Engineer battalion at Washington Barracks, D.C. When the battalion was ordered to Cuba in 1906, Captain Markham went with it to Camp Columbia where he spent much time improving the bridge and road system throughout the island.

The first of two brief tours as Little Rock District Engineer began on 30 August 1912 when Markham was thirty-five years old and thirteen years out of West Point. His second came in 1915. Both tours occurred during important periods for the Little Rock District. The disastrous flood of 1912, which completely engulfed the Mississippi, Missouri, and Ohio river valleys, focused attention on the issues of flood control and the development of hydroelectric power. Because commerce on the rivers within the District had declined so much, little federal expenditure on Corps activity was justified. The prospect of federal funding for flood control and hydropower development augured well for renewed activity by the Little Rock District, and the role of the District Engineer as spokesman and advocate for projects in the District was critical.

In 1916 Markham went to West Point as professor of practical military engineering. During World War I he served as commander of the 78th Engineering Division of the American Expeditionary Forces before serving as deputy director for light railways and roads. Following the armistice he was for a year Chief Engineer of the Army of Occupation in Germany.

Upon returning to the United States, Markham served as District Engineer at Detroit, Michigan. From 1925 to 1929 he commanded the Army Engineer School and Fort A.A. Humphreys (later Fort Belvoir), Virginia. In 1929 he toured Europe, Asia Minor, and North Africa to study foreign methods of hydraulic flood control. His subsequent report led to the establishment of the well-known Corps of Engineers' Vicksburg Laboratory.

Promotion to major general and appointment as Chief of Engineers came in 1933. General Markham held the post of Chief of Engineers until 1937, a period when he oversaw more large-scale expenditures than any other Engineer officer in peacetime history. These included the Fort Peck and Bonneville dams as well as all Works Progress Administration projects.

Markham's last assignment in the Army, before he retired in 1938, was a special study of the engineering-fortification needs of the Hawaiian islands. He then served as commissioner of public works for the city of New York. He died in Albany, New York, on 14 September 1950.

Captain A.B. Putnam

Born in Malden, Massachusetts, on 2 September 1877, Alfred Burpee Putnam was thirty-six years old when he assumed command of the Little Rock District on 10 March 1913.[26]

A graduate of the U.S. Military Academy's class of 1899, Putnam was commissioned a second lieutenant in the VII Artillery Corps. That summer he briefly administered the general prison at Alcatraz Island, California. After his promotion to first lieutenant in May 1901, he served with the Artillery Corps at Fort Slocum, New York; Fort Monroe, Virginia; Angle Island, California; Forts Flager and Casey, Washington; and Fort Banks, Massachusetts.

In 1902 Putnam transferred to the Corps of Engineers and went to the 3d Battalion of Engineers at Washington Barracks, Washington, D.C. From April 1903 to June 1905 he served as assistant to the District Engineer at Pittsburgh, Pennsylvania. He then transferred to the Philippines and served with the 1st Battalion of Engineers.

After returning to the United States in 1907, Putnam served for two years as assistant to the District Engineer in Chattanooga, Tennessee. He then went to Washington Barracks before transferring to Honolulu, Hawaii. He served temporarily as commander of the Honolulu District in 1911. The next year he was assigned to Fort Leavenworth, Kansas, where he remained until his transfer to the Little Rock District.

Putnam first served in the Little Rock District as assistant to the District Engineer. His subsequent tour as Little Rock District Engineer lasted two years, from 1913 to 1915. During this period Congress appropriated $6 million for improvements of the lower Mississippi valley, although only $48,000 was specified for the Arkansas River. As with his predecessor, Putnam was unable to initiate any permanent improvements on the rivers in the District.

The flood of 1913 renewed hope that Congress would appropriate funds to continue construction of flood control projects in the District; however, this was not to be. The remainder of Putnam's tenure was spent overseeing routine snagging and dredging operations.

On 8 June 1915, while still serving as Little Rock District Engineer, Major Putnam died of pneumonia.

Major E.J. Dent

Elliot Johnstone Dent, born in Pennsylvania on 1 November 1877, graduated from the U.S. Military Academy in 1901. He was immediately commissioned into the Corps of Engineers.[27]

Before assuming command of the Little Rock District on 13 October 1915, Dent was in the Philippines. His tour as District Engineer lasted 17 months, until 22 March 1917. Little activity and no new river improvement projects occurred despite considerable lobbying by local groups and individuals for increased federal expenditures.

Dent later served with the American Expeditionary Forces during World War I in the 104th Engineer Company and the 29th Engineering Division. He retired as a colonel in 1937 but returned briefly to active duty (1940-1941) during World War II. He died at Winter Park, Florida, on 10 January 1960.

Lieutenant Colonel G.P. Howell

George Pierce Howell was born in Goldsboro, North Carolina. While attending the University of North Carolina in 1889 he received an appointment to the U.S. Military Academy.[28]

Graduating first in the class of 1893, Putnam was immediately commissioned into the Corps of Engineers. From October 1893 to June 1896 he was assigned as a student to the Engineer School at Willet's Point, New York. Thereafter, he served as assistant to the District Engineers at Washington, D.C., and Portland, Maine. In 1898 he returned to Willet's Point where he served as an adjutant of the Engineer Battalion.

In 1901 Howell was promoted to captain and subsequently became secretary of the Mississippi River Commission. In 1903 he became commander of the Engineer Office at Charleston, South Carolina, and later engineer of the 6th Lighthouse District.

From 1907 to 1909 Howell managed fortification construction in the Philippines. During this tour he was promoted to major and became chief Engineer officer of the Philippine Department.

On his return to the United States, Howell served successively as District Engineer at Galveston, Texas, and at Charleston, South Carolina. In 1914 he went to the Army War College as a student and later as an instructor. When this tour ended he served with the 1st Engineers on the Mexican border from 1916 to 1917.

At age forty-seven Howell assumed command of the Little Rock District. His duty lasted just eight months, from 22 March until 13 November 1917. During this period the nation's attention, as well as Congress', was directed to the war in Europe, and little work was done in the District. When the United States officially entered the war, Howell transferred from the Little Rock District to the Southeastern Department where he served as department engineer and as commander of the 210th Engineers.

After the war Howell returned to Charleston, South Carolina, as District Engineer. On 1 December 1922, he retired because of a wartime disability. In 1927 he was recalled to active duty under the Chief of Engineers as Division Engineer for the Southeastern Division. One year later, on 15 September 1928, Colonel Howell died in Washington, D.C.

P.R. Van Frank

Phillip Reilly Van Frank, an 1881 graduate of Southeast Missouri State Teachers College and an 1889 graduate of the Missouri School of Mines at Rolla, Missouri, was the only civilian to serve as Little Rock District Engineer. Born on 27 November 1865 in Murphysboro, Illinois, Van Frank joined the Little Rock District as an assistant engineer in 1893. By the turn of the century he supervised all engineering work in the District except that on the Arkansas River.[29]

Van Frank was fifty-two years old and had been in the District twenty-four years when he assumed the role of Little Rock District Engineer during the time Army Engineers were in Europe serving with the American Expeditionary Forces during World War I. During his tenure as Little Rock District Engineer, which lasted from 1917 to 1919, most District activities were halted due to war. The work accomplished consisted of routine snagging and dredging operations on the White and Arkansas rivers.

With the end of hostilities in Europe, Army Engineers were once again available to assume command of the Districts. Van Frank relinquished his command duties and transferred to the Memphis District office. While there, he continued his career as senior engineer and a member of the District Engineer's staff. One of the many projects he was involved in was managing District efforts in the late 1920s to secure proper recognition of the historical significance of Elkhorn Tavern and the Pea Ridge Civil War Battlefield.

In 1932, before Van Frank's 1935 retirement from the Corps, the Memphis District published his "Random Notes on River Improvements." He returned to Little Rock where he maintained a residence on Summit Street until his death on 27 January 1941.

Major R.P. Howell

A native of North Carolina, Major R.P. Howell was thirty-seven years old when he assumed command of the Little Rock District on 22 September 1919. Graduating from the U.S. Military Academy in 1904, he was commissioned a second lieutenant in the Corps of Engineers.[30]

During World War I Howell served with the 90th Division of the American Expeditionary Forces and received the Distinguished Service Medal. After the war he returned to the United States where he served a tour of rivers and harbors duty.

Included in this tour was an assignment as Little Rock District Engineer which lasted only six months, from 22 September 1919 until 3 March 1920. The months following the end of hostilities in Europe proved no more active than the months before the war's end. During Howell's brief tenure as District Engineer he saw the lack of national interest in waterway development. What little funding the District obtained from Congress was again used for routine snagging and dredging on the White and Arkansas rivers.

After leaving Little Rock, Howell served as assistant chief engineer from 1938 to 1941, for which he received the Legion of Merit. In 1941 he retired, but events of World War II caused his recall to active duty. He retired disabled in 1946 and died on 21 July 1948 in Washington, D.C.

Major J.N. Hodges

John N. Hodges was commissioned into the Corps of Engineers after graduating from the Military Academy in 1905. Before assuming command of the Little Rock District on 3 March 1920 he served with the 6th Engineering Division of the American Expeditionary Forces in France.[31]

Although Hodges served as Little Rock District Engineer for less than a year, until 27 April 1921, he continued in command for more than three years. During his tenure District functions were transferred to the newly enlarged Memphis District. After the two Districts merged, Hodges commanded the Memphis District until 21 May 1923.

During his remaining career Hodges served with the Office of the Chief of Engineers, Washington, D.C. (1928-1931); as editor of the *Military Engineer* (1929-1931); with the U.S. Army Forces in the Middle East (1943); and as Division Engineer for the North Atlantic Division (1943-1944).

Hodges, born in Maryland in February 1884, retired as a brigadier general in 1944. He died in Brook General Hospital on 18 January 1965.

Major D.H. Connolly

Donald H. Connolly, born in Arizona on 11 February 1886, graduated from West Point in 1910. His commission was in the Corps of Engineers.[32]

Major Connolly served as Memphis District Engineer for five years, from 1923 to 1928. Commerce on the Arkansas River was at an all-time low, and Corps work was essentially limited to bank stabilization in the region formerly under the jurisdiction of the Little Rock District. Connolly's tenure, however, is notable because it encompassed the overwhelming floods of 1927 when an estimated one-half of Arkansas was underwater.

In 1934 Connolly became director of civil works for the city of Los Angeles, and from 1934 to 1935 he directed the Chicago River and Harbor District. He served as administrator for both the Works Progress Administration, southern California (1935-1939), and civil aeronautics, Department of Commerce (1940-1941).

Promotion to major general came in 1942 and, with it, the directorship of civil aviation for Army Air Forces headquarters. Connolly then served as commanding general of the Persian Gulf Command for the remainder of World War II, from 1942 until 1944. After the war he was assigned to the State Department where he served until retirement in 1948.

Following retirement from the military, Connolly became director of the Baltimore Department of Aviation from 1948 until 1956. He died in Fort Meade, Maryland, on 18 June 1969.

Colonel F.B. Wilby

Francis B. Wilby graduated from West Point in 1905 and was immediately assigned to the Corps of Engineers. Born in Detroit, Michigan, on 24 April 1886, he received his appointment to the Military Academy from Massachusetts.[33]

During World War I Wilby served as commanding officer of the 1st Engineers Regiment of the American Expeditionary Forces in France. He received the Distinguished Service Cross for his service. Following the war he graduated from Command and General Staff College at Fort Leavenworth, Kansas, and the Army War College. He later served on the War Department General Staff and, at one point, as chief of the Military Division, Office of the Chief of Engineers.

At age forty-five Colonel Wilby assumed command of the Memphis District in 1928. His tour as District Engineer lasted three years, until 1931. The initial years of his tenure were marked by implementation of the comprehensive plan for levee extension and augmentation along the Mississippi River, as called for in the Flood Control Act of 1928. This left little time or money for work in what is now the Little Rock District. The stock market crash of 1929 and the subsequent financial crisis shifted the nation's goals away from flood control. As a result, the Little Rock District received little attention or funding.

On the eve of World War II Wilby was chief of staff of the First Army, where he served with distinction from September 1939 to June 1941. Before his return to West Point he commanded the I Corps area. He was superintendent of the U.S. Military Academy from January 1942 until September 1945. General Wilby retired on a disability at age sixty-three in 1946. For the five months preceding his retirement he was the commanding general of the Engineer School and Training Center, Fort Belvoir, Virginia.

After retiring from the military, Wilby served as chairman of the New York State Power Authority (1946-1950). He became a consulting engineer with Knappen Tibbets Abbert Company. When he retired for a third time he moved to Asheville, North Carolina. He died on 20 November 1965 in Oteen, North Carolina.

Colonel B.B. Somervell

Brehon Burke Somervell was born in Little Rock, Arkansas, on 9 May 1892. A West Point graduate of the class of 1914, he was commissioned into the Corps of Engineers upon his graduation.[34]

Between 1916 and 1917 Somervell had a combat assignment with the Punitive Expedition to Mexico. During World War I he was adjutant of the 15th Engineer Regiment, Railway, which he helped to recruit and organize and which he accompanied to France. After several months he transferred and served as lieutenant colonel with the engineering construction staff of the 89th Division of the American Expeditionary Forces. He received the Distinguished Service Cross and the Distinguished Service Medal. After the armistice Somervell remained in Europe as Assistant Chief of Staff, Logistics Section, Third Army. In 1925 he assisted with the survey of navigation conditions on the Rhine and Danube rivers for the League of Nations.

Somervell served as Memphis District Engineer from 1931 to 1933 when national priorities focused on the nation's economic crisis, not on waterway projects. As a result, Corps activities in the region were minimal.

In 1933 and 1934 Somervell directed all field work for the Economic Survey of Turkey. In 1935 he became District Engineer at Ocala, Florida, and worked on the Florida Ship Canal. During this tour he met Harry Hopkins and later became Works Progress Administration administrator for New York City from 1936 to 1940.

Between 1941 and 1942 Somervell was assigned to the War Department General Staff where he served as assistant chief of staff, G-4. Later that year he was approached about a Construction Division job. During this time consideration was given to removing the Construction Division from the Quartermaster Corps and placing it under the Secretary of War. On 28 November Somervell reported for temporary duty with the Construction Division. Two weeks later he was placed in command as chief of the division. About this time the Air Corps construction was being transferred to the Corps of Engineers. This transfer of Air Corps projects represented one-third of the Army's construction program.

In 1942 Somervell was promoted to lieutenant general and assigned commanding general of the Army Service Forces. He held this position until 1946. He received two Distinguished Service Medals and several other medals during the course of World War II. His promotion to four-star general came in 1945.

Somervell retired as a major general in 1946 and later served as president and chairman of the board of Koppers Company, Inc. He received many honors, decorations, and awards. He died on 13 February 1955 in Ocala, Florida.

Major W.M. Hoge

Major William Morris Hoge was thirty-nine years old when he assumed command of the Memphis District in 1933. Born in Boonville, Missouri, on 13 January 1894, he graduated from the U.S. Military Academy in 1916 and was commissioned into the Corps of Engineers.[35]

Hoge's first assignment was along the Mexican border with the 1st Engineers. In May 1917 he took command of a company of the 7th Engineers at Fort Leavenworth, Kansas. He was still with the 7th Engineers in February 1918 when the regiment sailed for France. He became a major and commanded a battalion while in France, receiving the Distinguished Service Cross and the Silver Star. After hostilities ended he returned to the United States to rivers and harbors duty, earned a bachelor of science degree in civil engineering from the Massachusetts Institute of Technology, and graduated from Command and General Staff School.

Hoge's subsequent tour as Memphis District Engineer was from 1933 to 1935. During this period of President Roosevelt's New Deal came the great optimism that funds would become available for river improvement. As flood control was the chief concern for those in the Arkansas region, Hoge's efforts were in this endeavor. Always respectful of the great rivers, he concluded that flood control was a military problem and should be treated as such. During his final months as District Engineer he directed experiments in bank stabilization and revetment. He left the Memphis District with a sound flood control program.

In 1935 Hoge transferred overseas and served as Division Engineer in the Philippines, commanding the 14th Engineer Battalion, Philippine Scouts. General MacArthur later requested his services as chief of engineers for the newly activated Philippine Army.

During World War II Hoge served as commanding officer for the construction of the Alaska-Canada (Alcan) military highway. After a brief stint with the 9th Armored Division, he served in England as commander of the Provisional Engineer Special Brigade Group and was at Omaha Beach on D plus 1. That same year, 1944, he was named commander of Combat Command B of the 9th Armored Division. The next year he became commanding general of the 4th Armored Division.

Hoge returned to the United States at the end of the war. He served as commanding general at Fort Belvoir, Virginia, for two years before transferring overseas to Trieste, Italy. When fighting began in Korea, Hoge commanded the IX Corps. A year later he became commanding general of the Fourth Army.

After the war ended in Korea Hoge returned to the United States, but he immediately left for Europe as commanding general of the Seventh Army. That same year he became commander in chief of the U.S. Army in Europe.

Hoge retired from the Army in 1955 at the age of sixty-one as a lieutenant general. He remained active in retirement, serving as chairman of the board for Interlake Iron Company in Cleveland, Ohio, from 1957 to 1967. He moved to Kansas following his second retirement. He died there on 29 October 1979.

Lieutenant Colonel Eugene Reybold

Born in 1884, Lieutenant Colonel Eugene Reybold was fifty-one years old when he was assigned a tour as Memphis District Engineer in 1935.[36] During this period he was responsible for construction of levees and other flood control devices in the geographic area of the former Little Rock District, as well as for the Mississippi River from Memphis, Tennessee, to the confluence of the Ohio at Cairo, Illinois.

In 1937 a disastrous flood hit the lower Mississippi valley. As District Engineer, Reybold had forecasted the coming of the flood and had taken preventive measures to curb the destructive power of the Mississippi and its tributaries. The flood of 1937 forced the issue of flood control to be brought to the nation's attention. It also showed that the then-current boundaries of the Memphis District were too vast.

That same year the Little Rock District was reactivated and placed under the jurisdiction of the new Southwestern Division. Reybold was the first Division Engineer of this newly created body. As a result of both District and Division headquarters being located in Little Rock, he became keenly aware of the problems of the region.

In 1940 Reybold left Little Rock and was assigned as assistant chief of staff for the Supply Division of the War Department. This proved to be only a temporary assignment, for the next year he became Chief of Engineers.

As Chief of Engineers during World War II Reybold saw the transfer of Army Air Corps construction to the Corps of Engineers. He also did not forget the region he had served for so many years. One of his last acts as Chief of Engineers was to overrule the Board of Rivers and Harbors—which had rejected the navigation portion of the Arkansas River Project—by stating in a letter to the Secretary of War that the navigation feature of the project was justified in his opinion and that the project should be authorized. As a result, Reybold's decision may have saved the Arkansas River Navigation Project from termination in the early period of the program.

After a successful career with the Corps of Engineers, General Reybold died in 1961.

Lieutenant Colonel Daniel Noce

Major Daniel Noce assumed command of the Memphis District in 1937. While serving as Memphis District Engineer he was promoted to lieutenant colonel. During his three-year tour the District's primary activities were refining and experimenting with various revetment and bank stabilization methods to curb the severe erosion experienced along the Arkansas and White rivers.[37]

Noce, born in Colorado on 3 November 1894, served with and later commanded a regiment of Engineers with the American Expeditionary Forces during World War I. He also served a routine tour of rivers and harbors duty in the United States before commanding the Memphis District.

Following service at Memphis, Noce was commanding officer of the Engineer Amphibian Command (1942-1943). For the next year he was Assistant Chief of Staff, G-3, European Theater of Operations, and from 1944 to 1945 he served as Assistant Chief of Staff, G-3, Allied Force Headquarters, North African Theater of Operations. When the war ended he returned to the United States as Director of Plans and Operations in the War Department.

From 1946 until his retirement in 1952 Noce held a variety of positions including Chief of Staff and Deputy Commanding General, Army Service Forces, War Department; Chief, Civil Affairs Division, War Department Special Staff; Deputy Director of Logistics, Department of the Army; Chief of Staff, Headquarters, European Commands; and Inspector General, Department of the Army.

After retirement Noce began farming in 1954, was appointed chairman of the Rappahonnock City Planning Commission in 1961, and from 1968 to 1970 was a zoning administrator. He died on 17 January 1976 in Charlottesville, Virginia.

Lieutenant Colonel S.L. Scott

A native of New Albany, Indiana, Stanley Lorenzo Scott graduated from the U.S. Military Academy in 1916 and was commissioned into the Corps of Engineers. Twenty-one years later, at the age of forty-four, he assumed command of the Little Rock District on 1 July 1937.[38]

During World War I Scott briefly served with the American Expeditionary Forces in France. After his return to the United States he served a routine tour of rivers and harbors duty.

Scott's growing experience in rivers and harbors improvements led him to be named District Engineer for the newly reestablished Little Rock District in 1937. He served in this capacity for the next three years. As Little Rock District Engineer he assumed the responsibilities for levee construction and project development previously under the jurisdiction of the Memphis District.

Over the next three years the Little Rock District's major activities were recovering from the flood of 1937. Other projects begun during Scott's tenure included construction of floodwalls at Newport and North Little Rock, Arkansas. When Congress passed the Flood Control Act of 1938, the Little Rock District assumed responsibilities for the construction of Clearwater Dam on the Black River, Nimrod Dam on the Fourche LaFave, and Blue Mountain Dam on the Petit Jean. Scott oversaw preliminary design work begun before his departure. He also was involved with the temporary move of the District office from Little Rock to Dalias and the permanent move of the Division office to that same city.

Scott accompanied the move to Dallas as Division Engineer, a position he held from 1941 to 1942. At this same time, former Southwestern Division Engineer Eugene Reybold was named

Chief of Engineers. At the end of his tour as Division Engineer, Scott was promoted to brigadier general and made chief of the Persian Gulf Command in Iran. Here he supervised construction of roads, railways, and port facilities that aided the Allies in their struggle against Nazi Germany.

In 1944 General Scott transferred to the headquarters of the Army Service Forces of the War Department, remaining there until 1946. For the next two years he served on the War Department General Staff. In 1948 he became commander of the U.S. Army Forces, Alaska, remaining there until 1950. The next year he transferred to the Office of Military Assistance in the Office of the Secretary of Defense; from there he became commanding general and commandant of the Engineer School at Fort Belvoir, Virginia, where he remained until his retirement in 1954. Major General Scott died on 12 March 1984 in Dallas, Texas.

Colonel T.F. Kern

Colonel Thomas Francis Kern assumed command of the Little Rock District on 18 December 1940. Born in Texas on 10 January 1897, he graduated from the U.S. Military Academy in 1918 and was commissioned into the Corps of Engineers.[39]

Kern served as District Engineer for nearly a year and a half, until 1 April 1942. When the United States entered World War II, most of the District's activities became military construction, and dam and reservoir work was curtailed.

From 1942 to 1944 Kern served at Fort Belvoir, Virginia. In 1945 he transferred to Providence, Rhode Island, where he became District Engineer. At the age of 56 he retired from active duty in 1953 as a colonel.

He died 30 January 1972 in Washington, D.C.

Colonel A.M. Neilson

A.M. Neilson, a native of Minnesota, was appointed to the U.S. Military Academy in 1915. Immediately upon his graduation in 1918 he was commissioned into the Corps of Engineers. Twenty-four years later, at the age of forty-five, he assumed command of the Little Rock District on 2 April 1942.[40]

During World War I Neilson served at various Army camps throughout the United States. From 1919 to 1920 he was assigned as a student to Fort Belvoir, Virginia.

In 1921 Neilson served under General Taylor during the construction of the Georgetown Bridge. One year later he was assigned to the Office of the Chief of Engineers in Washington, D.C. In 1923 he transferred overseas where he served for two years in the Philippines. He assisted in making a survey of the Bataan Peninsula.

Upon returning to the United States, Neilson served two years at Fort Winfield Scott in San Francisco. In 1927 he returned to West Point as an instructor of civil and military engineering. Four years later he was ordered to Charleston, West Virginia, where he directed the construction of the roller-gate dams at London and Marmet, West Virginia. Following this tour he served as executive officer in the Huntington Engineer District from 1933 to 1934.

Neilson's next assignment brought him to the Ohio River Division where he served as assistant to the Division Engineer. Six months after this assignment ended, he became executive officer to the District Engineer at Cincinnati, Ohio. In 1935 he again transferred overseas and served with the 3d Engineers at Schofield Barracks in Hawaii. For the next two years he directed road construction in Hawaii. From 1937 to 1938 he served as assistant department engineer at Fort Shafter, Hawaii, until he returned to the United States.

Upon his return to the continental United States, Neilson was assigned to the position of District Engineer at Kansas City. His subsequent tour of duty as Little Rock District Engineer lasted a year and a half, from April 1942 to November 1943. He was a popular District Engineer, serving during wartime when little was done in the way of civil works projects. Norfork Dam's completion was given military priority as its hydroelectric power-generating capabilities were deemed important to the war effort. As District Engineer, Neilson was also responsible for the construction of Army warfare training camps, aircraft training schools (Stuttgart and Newport in Arkansas), two prisoner-of-war camps, two Japanese relocation centers, and an arsenal at Pine Bluff.

In 1943 Neilson transferred to the Southwest Pacific where he commanded an Engineer boat shore regiment and participated in the New Guinea and Leyte Gulf landings. At the end of the war he was supervising construction in the Philippines in preparation for landings to be made in Japan.

Colonel W.A. Davis, Jr.

William Arthur Davis, Jr., was born in Pittsburgh, Pennsylvania, on 15 June 1909. He was appointed to the U.S. Military Academy in 1927 and upon graduation in 1931 was commissioned into the Coast Artillery.[41]

Davis did not, however, serve in the Coast Artillery. Instead, he took a detail with the Construction Division of the Quartermaster Corps and for two years served as assistant constructing quartermaster. He later transferred to the regional construction office of the Quartermaster General, first at Louisville, Kentucky, then at Washington, D.C. Following this tour he went to the Carnegie Institute of Technology as a student.

After graduating with a master of science degree in civil engineering in 1935, Davis transferred to the Panama Canal Department. He remained there three years before serving at Fort Brady, Michigan, for two years. When the Corps of Engineers became responsible for military construction, he transferred to the Corps.

Davis' first assignment was a tour with the Nashville Engineer District. His second was with the Little Rock District. He was thirty-four years old and twelve years out of West Point.

As Little Rock District Engineer, a position he held from 1944 to 1945, Davis was directly responsible for all military construction in the District. He involved himself with flood control projects that were either under way or suspended since the war.

In 1945 Davis was ordered to the Philippines as executive officer of the General Engineer District at Manila. The next year he was made District Engineer of the Guam District, Western Pacific Division. Subsequent tours of duty included tours as Deputy Chief of Staff, Special Weapons Project, Corps of Engineers in Washington, D.C.; and District Engineer, Trans-East District at Karachi, Pakistan. He also served briefly as chief of the U.S. Army Overseas Supply Agency in New Orleans.

Davis, who retired on disability in 1961, died on 12 September 1980. During his retirement he had become actively involved with the Southeastern Regional Planning Commission and had provided it with valuable professional advice on the construction problems being experienced there.

Colonel R.D. Burdick

Colonel Roy Dayton Burdick was fifty-two years old and had served in the Army for twenty-nine years when he assumed command of the Little Rock District on 15 January 1945. Born in Homer, New York, on 21 June 1892, he graduated from

Cornell University as a civil engineer in 1914. He entered the Army in 1916 and was commissioned a second lieutenant.[42]

During World War I Burdick served with the Coast Artillery Corps and was promoted to captain. In 1920 he transferred to the Corps of Engineers. Over the next several years he served routine tours of duty.

From 1931 to 1935 Burdick was assigned to the Office of the Assistant Secretary of War. In 1935 he was ordered to the Memphis District where he became chief of operations for the next three years under General Reybold. During the flood of 1937 Burdick was in direct charge of the flood control measures at Cairo, Illinois.

During World War II Burdick's assignments included tours with the Army Service Forces depots at Ogden, Utah, and Columbus, Ohio, where he served as Engineer supply officer. In June 1944 he transferred to St. Louis where he became Deputy Division Engineer for the Upper Mississippi Valley Division.

Burdick's subsequent tour as Little Rock District Engineer lasted one year, from 1945 to 1946. During this period work was resumed on the dam and reservoir projects begun before the war. As the war ended, more work was scheduled and appropriations were made available to continue the flood control projects. During his tenure Burdick took a keen interest in the congressionally approved Arkansas River project as well as other projects and supported all phases of planning and construction.

Because of Burdick's continued interest in the civil works projects of the Little Rock District, he remained in the area after his retirement in 1946. He soon became an engineering consultant for various dam, bridge, and flood control projects. He remained in Little Rock until his death on 2 December 1954.

Colonel G.E. Galloway

Gerald Emery Galloway, born in New York City on 4 December 1903, received his appointment to the U.S. Military Academy in 1921. Immediately upon graduation from West Point in 1925 he was commissioned into the Corps of Engineers.[43]

Galloway first saw service with the 1st Engineers at Fort DuPont, Delaware. A year later he went to Cornell University and earned a bachelor of science degree in civil engineering. After graduating from Cornell, his next posting was the Engineer School at Fort Belvoir, Virginia.

From 1928 until 1940 Galloway served as an instructor of chemistry and electricity at West Point; in Panama with the 11th Engineers; at Mobile, Alabama, with the District Engineer office; as resident engineer at Tuscaloosa Lock and Dam; and in the Office of the Chief of Engineers. In 1940 he went to Puerto Rico to serve as executive officer and District Engineer during the construction of airfields there.

In 1941 Galloway became a major and, later that year, colonel. During World War II he was assigned to the Engineer Amphibian Command of the Corps of Engineers. He next received command of the 543d Engineer Amphibian Regiment of the 3d Engineer Special Brigade, a position he held until his tour of duty in the Pacific ended in 1945.

Colonel Galloway was forty-two years old and twenty-one years out of West Point when he became Little Rock District Engineer in 1946. During his tour of duty at the District, which lasted until 1948, construction continued on dam and flood control projects: completion of Blue Mountain Dam (1947), near completion of Clearwater Dam, and startup of Bull Shoals. Like his predecessors, Galloway strongly advocated comprehensive flood control measures.

The year after Galloway's term at Little Rock ended he was assigned to the Office of the Chief of Engineers. The next year, 1950, when fighting began in Korea, he transferred to the 9th Engineers there. After the conflict he returned to the United States as commander of the Army Engineer Center and then became commanding general (1958-1960) at Fort Belvoir, Virginia. His next assignment was Division Engineer for the Pacific Ocean Division, a position he held until his retirement in 1962 as a major general.

After retiring from active duty, Galloway became deputy director of public works for Nassau County, New York. Thereafter he returned to Washington, D.C., where he served as director of the Washington office of the consulting firm of MacFarland, Johnson, and Gibbons. He retired from the firm in 1978. Galloway died on 28 April 1980 in Annandale, Virginia.

Colonel T.A. Lane

Thomas Alphonsus Lane was born in Roslindal, Massachusetts, on 19 November 1906. In 1924 he received an appointment to the U.S. Military Academy. Immediately after graduation in 1928 he accepted a commission to the Corps of Engineers.[44]

Lane's first assignment was to rivers and harbors duty in the Detroit Engineer District. In 1929 he transferred to a provisional battalion of the Army Engineers organized to survey the Nicaraguan Canal. After the survey, in 1931, he entered the Massachusetts Institute of Technology and received a bachelor's degree in civil engineering in 1932. He then went to the Engineer School at Fort Belvoir, Virginia.

Lane next served in the Memphis District for two years. He returned to West Point as instructor for the next four years. Prior to World War II he served two years with the 11th Engineer Regiment in the Panama Canal Zone.

During World War II Lane was executive officer at Army Engineers headquarters, Army Air Forces, Washington, D.C. He subsequently distinguished himself while serving on General MacArthur's engineering staff at Brisbane, Australia, and received the Distinguished Service Medal.

Lane returned to the United States when hostilities ended in the Pacific. He served on the Joint Operations Review Board for six months before going to the Air Command and Staff School at Maxwell Field, Alabama, as an instructor.

Lane's subsequent tour as Little Rock District Engineer lasted a year and a half, from 30 July 1948 to 10 January 1950, when he oversaw the continuation of construction on Bull Shoals Dam and other flood control measures outlined in the comprehensive flood control project. The Arkansas River Navigation Project, however, awaited funding.

After leaving the Little Rock District, Lane transferred to Okinawa where he served two years as District Engineer. In 1953 he returned to the United States to become commissioner of the District of Columbia.

In 1957 Lane went to Fort Leonard Wood, Missouri, to command the Army Basic Training Center. From 1960 until his retirement in 1962 as a major general, he served as president of the Mississippi River Commission. In his civilian career he dealt with public policy problems of the day, first as a staff military analyst for the St. Louis *Democrat*, then as executive director of the Institute of Human Progress. In 1972 he became the founding editor-in-chief of *Strategic Review* and later wrote several books. He died on 28 April 1975 in Washington, D.C.

Colonel H.W. Holmer

Colonel Hans William Holmer was forty-seven years old and twenty-three years out of West Point when he assumed command of the Little Rock District on 1 July 1950. Born in Montana on

20 July 1903, he attended the University of California from 1919 to 1921 and then joined the Regular Army. He received his appointment to the U.S. Military Academy in 1923.[45]

After graduating from West Point in 1927 Holmer was commissioned into the Corps of Engineers. His early years of service included tours of duty on the construction of locks and dams on the Ohio River.

Holmer studied at Cornell University in 1930 and earned a bachelor of science degree in civil engineering. He returned to West Point as an instructor in the Department of Natural and Experimental Philosophy. Additionally, he studied at the Engineer School, Fort Belvoir, Virginia, and at Fort Leavenworth, Kansas, and served as District Engineer at Fort Peck, Montana. In 1941 he returned to West Point as an assistant professor of mechanics.

During World War II Holmer served at Headquarters, Army Ground Forces. His assignment as executive officer of the Engineer Section preceded his assignment as engineer of the Army Ground Forces. At war's end he was deputy director of the Transport Office of the Military Government in Berlin. When he returned to the United States two years later he served in the Office of the Chief of Engineers until 1950.

Holmer's subsequent tour of duty as Little Rock District Engineer lasted two years from 1950 to 1952. During this period Bull Shoals Dam was completed and ground was broken for Table Rock Dam and Reservoir. Despite the fact that war had just begun in Korea, plans for additional dam and reservoir projects were continued. Under Holmer recreation became an integral part of Corps activities in the District.

Holmer retired in December 1954 to accept a position as engineer for the Los Angeles office of the Continental Service Company. He died on 20 January 1967 in Los Angeles, California.

Colonel T.J. Hayes III

A 1936 West Point graduate, Thomas Jay Hayes was born in Omaha, Nebraska, on 26 August 1914. He assumed command at the Little Rock District on 10 October 1952.[46]

Hayes' career with the Corps of Engineers began when he graduated from West Point. His first assignment was as a student at the Massachusetts Institute of Technology where he received a master's degree in civil engineering. Prior to World War II he served with various Engineer troop units throughout the United States.

During the war Hayes' service included construction assignments in Greenland, Canada, Alaska, and the Caribbean.

In 1944 he directed training at Fort Belvoir, Virginia. That year he also traveled on a special mission to various battlefields in the Pacific theater.

From 1946 to 1949 Hayes served as Engineer liaison officer in England and the British Zone of Germany and as assistant military attache' at the Court of St. James. Following this foreign service he returned to Washington, D.C., to become assistant commissioner in charge of public works, civil planning, and civil defense.

Hayes' subsequent tour of duty as Little Rock District Engineer lasted one year, from 1952 to 1953. All civil works construction in the District had been halted due to the war in Korea. The work accomplished consisted of surveys and studies of multipurpose projects for the Arkansas and White rivers.

With his tour of duty completed in the Little Rock District, Hayes became District Engineer at Omaha, a position he held for the next four years. In 1958 he served as engineer with the I Corps in Korea.

From 1967 to 1969 Hayes served as Division Engineer in the South Atlantic Division. In 1969, at the age of fifty-five, he retired on disability with the rank of major general. He then became president and later chairman of the International Engineer Company. He retired again in 1980. In 1984 he was living in San Francisco, California.

Colonel J.A. Clema

Joe A. Clema was born in Steinauer, Nebraska, and earned a degree in mechanical engineering from the University of Nebraska in 1934. He pursued a career in civil engineering before entering the Army in 1940.[47]

During World War II, while serving with the famous 2d Armored "Hell on Wheels" Division, Clema saw action in North Africa, Sicily, France, Belgium, Holland, and Germany. After the war he returned to the United States and served three years as executive officer at the Galveston Engineer District. He then entered the Army Command and General Staff College, graduating in 1950.

When war broke out in Korea, Colonel Clema served in the front lines and also as construction engineer and Assistant Chief of Staff for Operations, 2d Logistical Command. For this he received the Legion of Merit.

During his next fifteen-month tour, at Barksdale Air Force Base in the Little Rock District, Clema supervised construction at Barksdale and Alexandria Air Force Bases and at the Louisiana Ordnance Plant. He also frequently served as acting District Engineer.

Clema's tour as Little Rock District Engineer lasted less than one year, from 10 August 1953 to 23 May 1954. During this period construction work on the lock and dam projects progressed at a moderate pace. Clema took an active role in the planning and design of Table Rock and Beaver dams.

Following Clema's tenure as Little Rock District Engineer he became secretary of the Mississippi River Commission and Deputy Division Engineer for the Lower Mississippi Valley Division. He retired to Texas where he died in the mid-1980s.

Colonel S.L. Brown

Colonel Stanton Lindsley Brown served twenty years with the Corps of Engineers before becoming Little Rock District Engineer on 21 June 1954. Born in Connecticut on 3 August 1910, he graduated from the U.S. Military Academy in 1934 and accepted a commission in the Corps of Engineers.[48]

Brown immediately entered the Massachusetts Institute of Technology, receiving a master's degree in civil engineering in 1938. From 1938 to 1942 he taught civil and military engineering at West Point.

During World War II Brown activated and commanded the 835th Engineer Aviation Battalion in the Mediterranean theater. He served as officer in charge of airfield construction during the invasion of southern France and as engineer for the Twelfth Air Force in Italy during the surrender of the German Army in the Alps.

When Brown returned to the United States he worked on the Manhattan Project at Oak Ridge, Tennessee. He also was with the Armed Forces Special Weapons Project in Washington, D.C., and the Armed Forces Staff College in Norfolk, Virginia.

From 1950 to 1953 Brown served overseas as chief of the construction branch of the U.S. European Command Headquarters in Frankfurt, Germany. Returning to the United States in 1953, he became executive officer of the Upper Mississippi Valley Division at St. Louis, Missouri. His subsequent tour as Little

Rock District Engineer lasted from 1954 to 1958. Like his predecessors, he was responsible for construction of flood control projects in the District. In October 1954 construction began on Table Rock Dam and Reservoir. Plans were also laid out for future dam and reservoir projects. During Brown's tenure as District Engineer the Arkansas River Navigation Project began to take form. After approval in 1946 the project's design phase was initiated. In 1951 initial construction began; in 1957 a flood forced additional action. In June 1957 ground was broken for Greers Ferry Dam.

After his tour in the Little Rock District, Brown retired on disability with the rank of colonel. He became president of Philips-Morse Construction in 1967, and from 1976 to 1977 served as the vice-president of Little Rock Yacht Sales, Inc. After civilian retirement, Brown resided in 1984 in Madison, Connecticut.

Colonel A.M. Jacoby

At the age of forty-three, Colonel Arthur Milton Jacoby assumed command of the Little Rock District on 1 April 1958. A native of Pennsylvania, he was a 1936 graduate of the U.S. Military Academy and commissioned into the Corps of Engineers.[49]

Jacoby's first assignment was with the Pittsburgh Engineer District. He then entered the Massachusetts Institute of Technology and earned a master's degree in civil engineering in 1939.

During World War II Jacoby assisted a previous Memphis District Engineer, William M. Hoge, in the construction of the Alcan Highway. He also served as commander with the 93d Engineers on Air Corps construction in Europe. After the war he served with the U.S. Army mission to Quito, Ecuador, and in the Office of the Chief of Engineers and with various Engineer combat units.

During the Korean conflict Jacoby served as executive officer of the Engineer Section of the Korean Base Section and also as port engineer at Pusan. After returning to the United States he was executive officer in the Engineer Section of the Sixth Army in San Francisco, California. He then served briefly in the South Atlantic Division.

Jacoby's subsequent tour as Little Rock District Engineer lasted from 1958 to 1961. The economic and recreational benefits of the Arkansas-White rivers projects became apparent during his tenure. Jacoby was aware of this reassessment of District priorities and advocated the recreational benefits and the public's concern for them.

During Jacoby's tenure as District Engineer a controversy between trout and bass fishing interests very nearly halted construction on Greers Ferry Dam and Reservoir. Due to the time and money necessary to redesign the project, Jacoby decided not to include a warm-water release at the dam site, thus favoring the trout fishermen.

During Jacoby's tenure as District Engineer construction began at Dardanelle Lock and Dam in 1959. This was some of the first structural work done on the Arkansas River Navigation Project.

After completing his tour in the Little Rock District, Jacoby served with the 32d Engineer Construction Group. He had a tour as Deputy Division Engineer for the Ohio River Division. In 1964 he became commander of the Verdun General Depot Complex in France.

Jacoby retired in 1965 as a colonel. He earned an advanced degree at Duke University and became an assistant professor at Arkansas Polytechnic College. In 1984 he lived in Pensacola Beach, Florida, retired from teaching.

Colonel J.C. Dalrymple

Colonel John Clifton Dalrymple assumed command of the Little Rock District on 7 August 1961. Born in Brazil, Indiana, on 10 February 1912, he graduated from Rose Polytechnic Institute as an electrical engineer in 1935 and was commissioned a second lieutenant in the Corps of Engineers, U.S. Army Reserve.[50]

His active duty began in 1941 with the 24th Armored Engineer Battalion at Pine Camp, New York. He later commanded the 82d Engineer Combat Battalion at Camp Swift, Texas.

During World War II Dalrymple led the 82d Engineers onto the beaches of Normandy, France, in June 1944. For this and subsequent operations he received the Silver and the Bronze stars. The next year he commanded the 1117th Engineer Combat Group in the crossing of the Rhine River. For this action he received the Legion of Merit.

After the war Dalrymple returned to the United States, assigned to the Army Ground Forces headquarters at the Pentagon. He then attended the Command and General Staff College at Fort Leavenworth, Kansas, and graduated in 1947. The next year he received a master's degree in civil engineering from Iowa State College.

In June 1948 Dalrymple served as deputy engineer for the Third Army at Fort McPherson, Georgia. In 1949 he transferred overseas to the European command as battalion commander of the 1st Engineer Combat Battalion. He later served as assistant to the deputy chief of staff for operations. After this tour he returned to the United States and attended the Armed Forces Staff College. After graduation he became Deputy District Engineer at Huntington, Virginia.

Dalrymple served at the Pentagon from December 1955 to June 1958 as a chief of plans for the Office of Research and Development and from June 1958 to July 1959 as executive officer to the Secretary of War. In 1960 he graduated from the National War College and transferred to Korea where he served as senior Engineer Adviser to the Republic of Korea.

Dalrymple's subsequent tour as Little Rock District Engineer lasted one year, from June 1961 to June 1962. As District Engineer he directed all phases of construction and maintenance on the Arkansas-White river projects. In April 1962 Greers Ferry Dam operation began. That year Dalrymple became a brigadier general.

After his tour in the Little Rock District Dalrymple assumed command of the North Atlantic Division. He remained as Division Engineer from 1962 to 1965. In July 1965 he became Director of Military Construction, Office of the Chief of Engineers. The following year he became Director of Installations, Office of the Deputy Chief of Staff for Logistics. In 1968 he was promoted to major general and on 31 August retired from the Army.

Following retirement Dalrymple managed construction at the National Cathedral in Washington, D.C., for several years. In 1985 he retired again and was living in Alexandria, Virginia.

Colonel C.D. Maynard

Born in Fort Sill, Oklahoma, on 4 June 1919, Charles Dorsey Maynard received his appointment to the U.S. Military Academy in 1937. Immediately after graduating from West Point in 1941, he was commissioned into the Coast Artillery, but later transferred to the Corps of Engineers when the former was disbanded.[51]

During World War II Maynard served in the Philippines and New Guinea as executive officer for the 1311th Engineer

Regiment. He served in the Engineer Section, Armed Forces, in the western Pacific and later directed the Engineer base development planning for operations against Japan, as well as during its occupation.

When Maynard returned to the United States he became executive officer for the Historical Division of the War Department General Staff. In 1947 he received a master's degree in civil engineering from Harvard. From 1947 to 1948 he served as engineer in charge of airfield construction in Keflavick, Iceland. His next two years were with the 2d Infantry Division at Fort Lewis, Washington, where he commanded the 2d Engineer Combat Battalion and later served as its assistant chief of staff.

In 1951, Maynard received a master's degree in mathematics from Rensselaer Polytechnic Institute and went to West Point to become assistant professor of mathematics until 1954. He then attended the Command and General Staff College.

From 1955 to 1957 Maynard served as assistant engineer operations officer for the Seventh Army in Europe. After a one-year assignment as division engineer for the 2d Armored Division, he became commanding officer of the 17th Armored Engineer Battalion. In 1958 he became Chief, Military Personnel Appropriations Branch, Budget Division, Office of the Chief of Engineers.

Maynard's subsequent tour as Little Rock District Engineer was from 1962 to 1965. With the dedication of Greers Ferry Dam, the Little Rock District was the focal point of waterway construction in the United States.

In 1965 Maynard retired from the Army as a colonel. He immediately joined Arkansas-Louisiana Gas Company as a vice-president. In 1973 he left the power company to become senior vice-president and director of marketing for the Union National Bank of Little Rock. In 1985 he lived in Little Rock and served as a bank vice-president.

Colonel F.P. Bane

Frank P. Bane was born in Charles Town, West Virginia, in 1918. A graduate of the University of Virginia with a degree in mechanical engineering, he was commissioned into the Corps of Engineers in 1942.[52]

During World War II Bane entered active duty and served with various Engineer units in North Africa, Sicily, France, and Germany. From 1946 to 1949 he was on the Army General Staff. He then attended the Army Engineer School at Fort Belvoir, Virginia.

Bane's next assignment was with the Buffalo Engineer District as executive officer and briefly as District Engineer. He then transferred to the Army Command and Staff College, graduating in 1953. He went overseas to serve eighteen months in Korea.

After returning to the United States, Bane's assignments included tours with the Logistics Management Center at Fort Lee, Virginia, and as a student at Stanford University, where he received a master's degree in industrial engineering in 1958. He received an assignment to the Office of the Chief of Engineers, Washington, D.C. He then served briefly at Headquarters, U.S. Army Pacific, in Honolulu, Hawaii.

Bane was Little Rock District Engineer from 1965 to 1967. During this period the war in Vietnam was escalating and public attention turned to Southeast Asia. Work continued on the Arkansas River Navigation Project, and Bane presided over the opening of the first lock and dam at Pine Bluff in 1967. When he left, the navigation project was 64 percent complete.

After his tour in the Little Rock District, Bane became commanding officer of the 9th Logistics Command in Thailand. In 1968 he transferred to the New England Division at Waltham, Massachusetts, where he served as Division Engineer. He died in the 1970s.

Colonel C.L. Steel

Immediately after graduation from West Point in 1944, Charles Lowndes Steel was commissioned in the Corps of Engineers. Born in Panama on 22 March 1924, he received his appointment to the U.S. Military Academy in 1940.[53]

During World War II Steel served with the 1685th Engineer Combat Battalion in Okinawa. In 1945 he returned to the United States and attended Harvard University, where he received a degree in civil engineering. He also graduated from the Engineer School at Fort Belvoir, Virginia, in 1951. From 1951 until 1954 he served in Europe with the 485th Engineer Combat Battalion and at Headquarters, VIII Corps. For the next two years he served at the Army Map Service in Washington, D.C.

In 1957 Steel graduated from the Command and General Staff College. He went to Korea where he served with Headquarters, 44th Engineer Battalion. After returning to the United States he served in three successive positions with the Philadelphia Engineer District: assistant for air defense, assistant for military construction, and executive officer. From 1964 to 1966 he was a staff member of Supreme Headquarters, Allied Forces Europe, Paris, France.

Steel's subsequent tour as Little Rock District Engineer lasted from 1967 to 1970, when the financial strain of the Vietnam War was being felt nationwide. Despite the strain, construction continued on the Arkansas River Navigation Project, and by 1969 six locks and dams between Little Rock and Fort Smith had been completed. That year, Colonel Steel opened navigation to the Arkansas-Oklahoma state line.

In 1970 Steel retired from the Army and immediately joined the Arkansas Power and Light Company as director of public affairs. In 1985 he lived in Little Rock and was employed by the company as executive vice-president and chief, Public Affairs Office.

Colonel W.C. Burns

A graduate of the U.S. Military Academy class of 1948, Colonel William Curoe Burns assumed command of the Little Rock District on 13 August 1970. Born in Anamosa, Iowa, on 25 June 1927, he was commissioned into the Corps of Engineers in 1948 and was assigned to overseas duty.[54]

Burns' first assignments were in Okinawa and Korea with the 808th Engineer Aviation Battalion and the 931st Engineer Aviation Group as chief of construction and as construction platoon leader. In 1951 he served at Fort Belvoir, Virginia, until he entered Purdue University, where he received a master's degree in electrical engineering in 1954.

Burns returned to West Point as an instructor, and later as an assistant professor, in the Department of Electrical Engineering. He became assistant for operations and executive officer in Thule, Greenland, for one year beginning in 1958. From 1960 to 1964 he served in the Office of the Chief of Engineers. The next year he worked at the Office of Personnel Operations, Department of the Army. Several subsequent overseas assignments included service as an assistant Army member in the Office of the U.S. Defense Representative for the North Atlantic and Mediterranean Areas and as director of the Army Armament Division, U.S. Army. North Atlantic Treaty Organization. In 1969 he moved to the 2d Engineer Construction Group.

Burns was Little Rock District Engineer from 1970 to 1972. During this period he directed water resource management in the White River basin and the Arkansas River and its tributaries. The Arkansas River Navigation Project was renamed the McClellan-Kerr Arkansas River Navigation Project on 5 June 1971, and navigation was opened to Tulsa, Oklahoma.

Following his tour of duty in the Little Rock District, Burns transferred overseas and served as engineer to the Eighth Army in Korea.

On 18 September 1976, Burns died in Alexandria, Virginia.

Colonel D.G. Weinert

Colonel Donald Gregory Weinert assumed command of the Little Rock District on 24 July 1972. Born in Aberdeen, South Dakota, on 16 September 1930, he graduated from the U.S. Military Academy in 1952 and was commissioned in the Corps of Engineers.[55]

During the Korean conflict Weinert served as platoon leader of the 378th Engineer Combat Battalion and later as battalion staff officer. He returned to the San Francisco and the Sacramento Engineer Districts as assistant to the District Engineers. In 1957 he received a master's degree in civil engineering from Purdue University.

From 1958 to 1963 Weinert was with the 13th Engineer Battalion, 8th Division, in Europe and was a tactical officer at the U.S. Military Academy. In 1964 he graduated from the Command and General Staff College and in 1965 served as staff officer for Headquarters, Eighth Army, in Korea.

In 1966 Weinert graduated from the Armed Forces Staff College and was transferred to Germany to command the 79th Engineer Battalion. In 1968 and 1969 he attended the Army War College before serving a tour in Vietnam. In 1970 he went to the Office of the Assistant Vice Chief of Staff.

For overseas service in Europe, Korea, and Vietnam, Weinert received the Legion of Merit, the Army Commendation with three oak leaf clusters, the Bronze Star with an oak leaf cluster, the Meritorious Unit Citation, and the Parachutist Badge, in addition to numerous service medals.

Weinert's tour as Little Rock District Engineer lasted from 1972 to 1975. During this period District activities were criticized by leading environmentalists. Weinert directed the Little Rock District's successful support of the Corps' environmental efforts.

From 1975 to 1978 Weinert served in the Engineer Studies Center of the Corps of Engineers. In 1978 he retired as a brigadier general. After leaving the Army, Weinert became executive director of the National Society of Professional Engineers, a position he was holding in 1985. He resides in McLean, Virginia.

Colonel C.E. Edgar III

Born in Mobile, Alabama, on 15 January 1936, Colonel Charles Ernest Edgar III assumed command of the Little Rock District on 25 June 1975. He graduated from Virginia Military Institute as a civil engineer and distinguished military graduate in 1958 and was commissioned into the Corps of Engineers.[56]

Edgar attended the Engineer Officer Basic Course at Fort Belvoir, Virginia. He later served in Germany as platoon leader and company commander of the 237th Engineer Battalion.

Edgar returned to the United States in 1961 and studied at Iowa State University, receiving a master's degree in civil engineering. After a subsequent assignment to Fort Belvoir he graduated from the Engineer Officer Career Course in 1963. He then became area engineer at the Louisville Engineer District.

In 1965 Edgar transferred overseas to the U.S. Military Assistance Command in Vietnam. He was an adviser to the Vietnamese 62d Engineer Battalion and later to the 6th Engineer Group.

Edgar returned to the United States to the Office of Personnel Operations, Department of the Army. In 1968 he attended the Command General Staff College at Fort Leavenworth, Kansas. The following year he returned to Vietnam as Engineer plans officer (I Field Force) and later commanded the 577th Engineer Battalion. In 1970 he returned to Washington, D.C., as a staff officer in the Plans Directorate, Office of the Deputy Chief of Staff for Military Operations. He attended the U.S. Naval War College from 1973 to 1974 and served as executive officer at the Engineer School at Fort Belvoir, Virginia.

After seventeen years of service in the U.S. Army, Edgar became Little Rock District Engineer. His tour lasted from 1975 to 1978 when most District activities were maintenance and promotion of the McClellan-Kerr Navigation System. Tonnage carried on the waterway peaked at 10 million during this time. Increased recreation and tourism defined a new role for the Little Rock District.

Edgar later served as Division Engineer for the New England Division and he completed Howard University's Advanced Management Program for Senior Executive Fellows.

In 1982 General Edgar became Deputy Director of Civil Works, U.S. Army Corps of Engineers. In June 1985 he became acting director of civil works. The following month he was named Division Engineer, South Atlantic Division, in Atlanta, Georgia.

Among his military awards are the Legion of Merit (three awards), Bronze Star, Meritorious Service Medal, Army Commendation Medal (two awards), Air Medal, Meritorious Unit Citation, and several foreign awards.

Colonel D.K. Randels

Colonel Dale K. Randels had served in the Army for twenty-five years when he assumed command of the Little Rock District on 25 June 1978. Born and raised in Iowa, he graduated from the University of Missouri as a civil engineer.[57]

In 1953 Randels was commissioned into the Corps of Engineers. His military career included command of the 34th Engineer Construction Battalion (in Vietnam) and staff positions with Headquarters, Army Materiel Command; Headquarters, U.S. European Command; the Headquarters, Ballistic Missile Defense Systems Command; and Headquarters, U.S. Army, Vietnam. He also served in staff positions in Infantry and airborne troop units; as deputy province senior adviser in Vietnam; as a ROTC instructor; and as assistant area engineer, Eastern Ocean District, Newfoundland.

After undergraduate work at the University of Missouri, Randels earned a master's degree in engineering from George Washington University. He also graduated from the Command and General Staff College and the Army War College.

Randels was Little Rock District Engineer from 1978 to 1981. During this period he shared responsibility with the Tulsa District for the operation and maintenance of the McClellan-Kerr Navigation System and had responsibility for the Corps' civil works, especially in the White River basin of Missouri and Arkansas and that portion of the Arkansas River in Arkansas.

During Randels' tenure a Corps-wide realignment study was undertaken. Speculation that some Districts might close meant the Little Rock District faced having to transfer its civil works mission to the Tulsa District. The realignment study provided for the Little Rock District to assume responsibility for four projects in southwestern Arkansas for which operations and maintenance had been provided by the Tulsa District.

In 1985 Randels had retired from the military and was living in New Orleans, Louisiana.

Lieutenant Colonel L.S. Bonine

Lieutenant Colonel Larry S. Bonine had served in the Army seventeen years when he assumed command of the Little Rock District in January 1981. A native of Chattanooga, Tennessee,

he was born on 7 July 1941. He graduated from Tennessee Technical College as a civil engineer and was commissioned into the Corps of Engineers.[58]

Bonine served overseas with the Corps of Engineers as director of engineering and housing for the Armed Forces Recreation Center in Germany; as staff officer with the Headquarters, U.S. Army, Europe; as executive officer with the 317th Combat Engineer Battalion in Germany; as staff officer with the Headquarters, Eighth Army, Korea; as area engineer for the Mediterranean Division in Greece; and in several Engineer battalions in Vietnam and Germany.

Bonine served stateside as personnel management officer in the Pentagon and as post engineer for the Defense Supply Agency in Memphis, Tennessee. He studied at the University of Missouri at Rolla and received a master's degree in civil engineering. He later graduated from the Army Command and General Staff College.

Bonine's subsequent tour as Little Rock District Engineer was from 1981 to 1984. He shared responsibility for maintenance of the McClellan-Kerr Navigation System with the Tulsa District. During this period District activities increasingly became operations, maintenance, and recreation.

Following Bonine's tour as Little Rock District Engineer, he attended the Army War College and served in Korea. In 1987 he was promoted to colonel.

Colonel R.W. Whitehead

Colonel Robert W. Whitehead was forty-eight years old and had served in the Army twenty-three years when he became Little Rock District Engineer in August 1984. He assumed responsibility for the Corps' water resource development activities in a thirty-five thousand-square-mile area encompassing much of Arkansas and southern Missouri.[59]

In 1985, under Colonel Whitehead's command, the District added a tenth resident office: it assumed Corps design and construction support for Army and Air Force installations in Arkansas. From the new resident office and its satellite field offices, the District began serving the four major military installations in the state—Fort Chaffee, Pine Bluff Arsenal, Little Rock Air Force Base, and Blytheville Air Force Base. This military design and construction support extended to the Armed Forces Reserve components in the state. District plans include construction of major Armed Forces Reserve complexes in North Little Rock and Fort Smith.

Among projects undertaken since Colonel Whitehead's arrival were the $3.4 million flood reduction construction project at Clinton and levee and flood reduction work at Jacksonport.

Colonel Whitehead, born in DeWitt, Illinois, earned bachelor's and master's degrees in civil engineering from the University of Missouri at Rolla. He graduated from the Armed Forces Staff College and the National War College.

Colonel Whitehead held command assignments at Fort Leonard Wood, Missouri; at Fort Belvoir, Virginia; and in Vietnam and Korea. He held high-level staff assignments in the Office of the Army Chief of Staff, the Office of the Chief of Engineers, the Office of Personnel Management, and the Army Concepts Analysis Agency in Washington, D.C. He served as Deputy District Engineer in the Corps' Portland District.

His military decorations include two awards of the Legion of Merit, the Bronze Star Medal, and six awards of the Meritorious Service Medal.

Appendix II

Distinguished Civilian Employees

The key to the Little Rock District's ability to draw effectively on its past lies in its civilian employees. The normal stabilized tour of duty for military officers assigned to the Corps of Engineers is three years. Consequently, the District's top management changes frequently, and its leaders are generally men from outside the local area. The District's long-term civilian employees have saved it from the consequences of this loss of continuity and lack of site-specific experience and knowledge at the command level. The Little Rock District Engineers have, throughout the years, been able to rely on men and women experienced in the problems of the District for information about the District, its waterways and its projects.

The list of both current and retired long-term or key civilian employees who made outstanding contributions to the Little Rock District during their careers is too long to cite here. Therefore, the individual biographical sketches presented are limited to members of the Little Rock District family selected by their peers and colleagues to the Gallery of Distinguished Civilian Employees.

No current employees of the District are in the Gallery because a candidate must be retired or deceased for two years to be nominated for this honor. The Gallery is also limited to District employees who served after 1937. Thousands of equally qualified employees who served the District from 1881 to 1921 are excluded. Former employees selected to the Gallery since its establishment in 1975 do, however, represent the high standards of service and excellence of Little Rock District employees of all eras.

> To be selected for inclusion in the Gallery, an individual must have
>
> accomplished assigned duties in such a manner as to have been clearly exceptional and pre-eminent among all who have performed like or similar duties,
>
> developed and/or improved methods and procedures that produced extraordinary benefits for the Corps of Engineers,
>
> contributed substantially to the reputation and honor of the Corps of Engineers, and
>
> performed loyally and faithfully throughout the period of service.[1]

These rigid criteria attest to the character and outstanding performance of individuals selected to the Gallery of Distinguished Civilian Employees.

Paul E. Adams

Born in Newark, Arkansas, on 4 September 1910, Paul E. Adams served thirty-six years with the Corps of Engineers, thirty-three in the Little Rock District. He was named to the Gallery of Distinguished Civilian Employees in 1975.

An undergraduate at the University of Arkansas, Adams pursued graduate studies at Stanford, Georgia Tech, and Colorado State. His federal service began in 1935 with a temporary appointment as subinspector in the Memphis District, responsible for inspecting levees along the Mississippi and Ohio rivers.[2]

In 1936 Adams transferred to Fort Peck, Montana, during construction of Fort Peck Dam. After several months he was promoted to inspector. The next year he transferred to the Rock Island District, surveying for land acquisition for the Upper Mississippi River Navigation Project. He joined the Little Rock District as a surveyor a year after it reopened in 1937.

During his first months with the Little Rock District, Adams assisted in acquiring levee rights-of-way. In 1939 he was promoted to civil engineer aid. Two years later he became principal civil engineering aid, and two years after that, civil engineer.

As the District assumed more responsibilities during World War II and thereafter, Adams turned professionally to economic planning, and his professional growth after 1947 is impressive. He was assistant chief, Economics Section, and then became section chief. A promotion followed to Chief, Economic, Surveys and Drafting. Promoted to civil engineer economist in 1949, Adams continued his professional growth in 1953 when he was named supervisory general engineer. A year later he became supervisory engineer.

One of Adams' greatest contributions to the growth of the Little Rock District was in comprehensive basin planning. After serving as assistant chief of the Planning Branch, he became Chief, Comprehensive Basin Planning Branch in 1963. During the next several years he led the planning of water resources in the Arkansas and White river basins. For his efforts he received letters of commendation, superior performance awards, and the

thanks of several District Engineers for his efforts on behalf of the District. He also received the Department of the Army Decoration for Meritorious Civilian Service.

When Adams retired in 1971 he was chief of the Planning Branch serving as assistant chief of the Engineering Division for Planning and as liaison officer between the Governor of Arkansas and the five engineering Districts within the state. According to his peers, it was he who determined the evolution and implementation of the Planning Section in the Little Rock District.

Mr. Adams lives in Little Rock.

Robert L. "Shorty" Baird

Referred to by many as "Mr. Arkansas River," Robert L. "Shorty" Baird served with the Corps of Engineers for forty-three years. His thirty-three years of service to the Little Rock District led, in 1975, to the naming of a towboat in his honor.[3]

After graduating from Mississippi State University in 1927, Baird worked for the Memphis District, assigned to levee construction near Helena, Arkansas. His early service was in levee camps on the Black and Arkansas rivers.

Baird came to the Little Rock District in 1937 and immediately became involved in all phases of the District's civil works activities. His greatest contribution during his years in the Little Rock District was in bank stabilization and channel rectification along the Arkansas River. Upon his arrival in Little Rock, no regular bank stabilization work had been done to the Arkansas River since the District's disestablishment in 1921. Early bank stabilization included board matting and trench revetment. By the 1950s a general bank stabilization program was authorized as part of the Arkansas River Navigation Project. His contributions were invaluable during the initial phases of this project. As a civil engineer with the Construction Division, his contributions ranged from the design of dikes in the early days of the District to the design of new revetment methods for the Arkansas River from its mouth to Fort Smith.

In 1975, five years after his retirement, Baird was named, along with fourteen other District employees, to the Gallery of Distinguished Civilian Employees. Two years later the Little Rock District christened its newest towboat the M/V *Shorty Baird*, a tribute to a man affectionately referred to by his fellow employees as "Mr. Arkansas River."

Robert G. Barbour

Robert G. Barbour served with the Corps of Engineers for forty-six years. His employment with the U.S. government began in Memphis as a messenger boy in the Department of Commerce, Bureau of Foreign and Domestic Commerce, where he served from 1929 to 1931. The following year he took a civil service examination and joined the Memphis District, Corps of Engineers, in Butler, Arkansas, as an under clerk. During his time at Butler, his responsibilities included revetment work along the Arkansas River.[4]

That same year Barbour transferred to the Vicksburg District, also as an under clerk. During his assignment to northern Mississippi on the Sardis Reservoir project he received a promotion to junior clerk. He transferred in 1936 to Denison, Texas, when the Corps was conducting a survey for the construction of Denison Dam.

Returning to the Vicksburg District in 1937, Barbour soon became clerk. He returned to revetment work, experimenting with it up the Arkansas River near Dumas, Arkansas. In 1938 he transferred as a clerk to the Little Rock District and the following year returned to Denison, Texas, as supply officer. He stayed with the Denison District (established for the construction of Denison Dam) until 1943 when he entered the U.S. Navy as a member of the construction battalion units known as Seabees.

After the war Barbour worked for the Tulsa District as an administrative assistant from February to November 1946. He left to become supply officer with the newly established Garrison District (established to construct Garrison Dam) in Bismarck, North Dakota. He later became property and supply officer. While with the Garrison District, he received several promotions: in 1947 to procurement and supply officer, in 1948 to contract and supply officer, in 1952 to administrative officer, and in 1953 to comptroller.

In 1953 Barbour transferred to the Riverdale District to serve as comptroller. In 1959 he was selected for the same position in the Little Rock District. After moving he became involved with appropriations, staff management, management surveys, internal audits, and support purchases. In 1964 he became financial manager. During his tenure at Little Rock the dedication ceremony at Greers Ferry demanded great administrative skill. Its success can be attributed, in part, to Barbour's effective and efficient management.

Born in Memphis, Tennessee, on 26 February 1911, Robert G. Barbour retired from government service on 7 February 1976 after serving the Little Rock District for seventeen years.

Erwin D. Blakney

Erwin D. Blakney was among the original employees in the reactivated Little Rock District, joining in July 1937. His career with the District spanned two decades; his service with the Corps, nearly four.[5]

A native of Burnsville, Mississippi, Blakney was born on 14 July 1898. He attended the University of Mississippi and West Point. He graduated from the University of Arkansas Law School.

His government service began with Army service during World War I. After being discharged in December 1918, he received a temporary appointment as a clerk with the Ordnance Department's nitrate plant in Sheffield, Alabama. Two months later he transferred to the Corps of Engineers as a temporary inspector in Florence, Alabama. Becoming a permanent Corps employee in 1921, he transferred to the Nashville District.

After two years' service with the Nashville District, Blakney returned to Florence. In 1925 he went to the Louisville District as inspector, and three years later to the New Orleans River District. In 1929 he transferred to the Memphis District, and later that year he was promoted to clerk. Another promotion followed in 1932, to junior administrative assistant, a position he held until he transferred to the newly reactivated Little Rock District.

Blakney came to Little Rock in July 1937 as chief administrative assistant. As the District assumed more responsibility, the work load increased for its small number of original employees. In 1938 Blakney was promoted to senior administrative assistant. In 1941 he became principal administrative assistant. He was head administrative assistant when he was furloughed for active duty in 1942. He served in the Army as a major for the next four years.

After the war Blakney returned to the Little Rock District to serve as District comptroller. His official title was administrative officer. During the next seven years he solidified the financial network of the District, and in 1953 he became comptroller when this title was officially instituted in the District. He held this position until his death on 3 December 1958 at the age of sixty years.

For his nearly forty years with the Corps of Engineers, he was named to the Gallery of Distinguished Civilian Employees in 1975.

Harry G. Bozarth

Harry G. Bozarth's first job with the Corps of Engineers was at Lock and Dam Number 52 on the Ohio River near Brookport, Illinois, in 1927. He worked with the Louisville District for the next three years until transferring to the New Orleans District, where he remained for another three years.[6]

In 1931, after a short layoff, Bozarth returned to the Corps in the Memphis District. After three years he moved to Tucumcari, New Mexico, until transferring to Little Rock in July 1937.

Bozarth was among the first Corps employees to arrive at the newly reactivated Little Rock District. Assigned as personnel officer, he witnessed many changes in the District, including its military function during World War II and its return to civil works activities. During the McClellan-Kerr Navigation System project he was responsible for the personnel at one of the largest civil works projects in the United States.

Bozarth's service to the District was recognized with several outstanding performance ratings and superior performance awards. The Army awarded him the Meritorious Civilian Service Award (the second-highest civilian award in the Army).

In 1975 Bozarth received a final tribute for his years of service with the Corps by being named to the Gallery of Distinguished Employees.

Imogene W. Browning

Born 20 December 1902, Imogene W. Browning began her government service with the Little Rock District as a junior typist in 1938. In 1940 she became junior clerk typist.[7]

In 1951 Browning became chief of the Correspondence Section. She had received a promotion to assistant clerk typist, Office Service Branch, Correspondence Section, in 1943 and became a clerk stenographer in the same section in 1944.

As supervisor of fourteen to eighteen persons she maintained thorough training schedules and oversaw heavy work loads. High productivity, efficiency, and cooperation marked the unit under her direction.

Often called on by managers and supervisors to assist in problem solving, Browning received numerous outstanding performance and sustained superior performance awards and letters of commendation. After thirty-two years of dedicated service, Imogene W. Browning retired from the Corps of Engineers on 31 July 1970. She was named to the Gallery of Distinguished Civilian Employees in 1979, the first woman to receive this honor.

Howard C. Farison

Born 27 January 1907, Howard C. Farison joined the Corps of Engineers in 1937. For thirty-nine years he participated in the growth of the Little Rock District.[8]

Farison arrived in Little Rock shortly after the District reopened in July 1937. Coming as a junior draftsman from New Orleans, he became a junior civil engineer aid in Little Rock.

From 1939 to 1942 Farison received several promotions, the first to assistant civil engineer in 1939. His subsequent promotions were to civil engineer aid in 1940, to junior civil engineer in 1941, and to assistant electrical engineer in 1942. It was in electrical engineering and hydroelectric power that he made his greatest contribution to the District.

In 1944 Farison became senior powerhouse operator, and the next year superintendent of the powerhouse at Operations Division, Mountain Home Area Office, Mountain Home, Arkansas. In 1950 he became operating engineer (hydroelectric power) and then was reassigned as an electrical engineer.

As the District high-dam construction activities grew into multipurpose projects, Farison supplied the needed hydroelectric power studies. In 1955 he was superintendent of hydroelectric power projects, and two years later he was supervisory electrical engineer.

In 1960 Farison became supervisory electrical engineer (generation), Operations Division, Hydroelectric Branch. When the District reorganized in 1972 he joined the Construction-Operations Division, Hydro Control Branch.

Farison retired in 1976 after thirty-nine years with the Little Rock District. He received several commendations and awards and was named to the Gallery of Distinguished Civilian Employees in 1981.

William Kelly Finefield

William Kelly Finefield was born 31 August 1908. He served thirty-seven years with the Corps of Engineers, thirty-four in the Little Rock District.[9]

Finefield, a college graduate, joined the Corps in 1936, temporarily as an inspector at Fort Peck, Montana. The next year he transferred to the Little Rock District. His temporary assignment as a surveyor became permanent later that year. A promotion followed in 1938 to junior civil engineer. Two years after joining the Little Rock District, Finefield was promoted to assistant civil engineer; later that year he became associate civil engineer. In 1942 he transferred to the Southwestern Division in Dallas where he remained for the duration of World War II.

Returning to Little Rock in 1945, Finefield joined the Real Estate Division, where he made his greatest contribution to the Little Rock District. In 1950 he became supervising civil engineer and was reassigned as a civil engineer. In 1951 he became supervisory real estate officer. Finefield's responsibilities included evaluating and acquiring acreage for construction of civil and military projects throughout the District. His criteria for many procedures are still used by the District. As the Real Estate Division matured in the 1950s, his skills as a real estate officer became increasingly apparent. In 1952 he became a real property officer and in 1955 a supervisory real property officer.

For the next eighteen years Finefield worked to acquire vast amounts of acreage along the Arkansas River and at the Norfork and Bull Shoals reservoir sites. He retired as Chief, Real Estate Division, in March 1973.

Finefield's thirty-seven years with the Corps of Engineers culminated in his selection to the Gallery of Distinguished Civilian Employees in 1975.

Hugh C. Getty

A graduate of Kansas State University and the University of Arkansas, Fayetteville, Hugh C. Getty was born 19 February 1912. He began his career with the Corps of Engineers in January 1942 as an assistant draftsman. Over the next seven years his promotions ranged from assistant civil engineering aid to hydraulic investigative engineer. During this period his peers recognized his technical and professional abilities.[10]

In 1953 Getty was promoted to general hydraulic engineer. He excelled in hydrology; three years later he became general supervising engineer. His work in the development and application of the principles of hydraulic engineering eventually resulted in the construction of many projects that today are operated and maintained by the Little Rock District.

Getty's promotion to general supervisory civil engineer, Engineer Division, Comprehensive Basin Plan Branch, Arkansas Basin Section, came in 1963. The hydraulic engineering experience he brought to this position formed the nucleus of the

success of the White River Comprehensive Basin Study. In 1967 he joined the Flood Plain Management Section, Engineer Division, as a civil engineer. It was he who initiated and developed the Little Rock District's Flood Plain Management Program, a major accomplishment. The next year he went to the Engineer Division, Flood Plain Management Services Branch.

On 4 January 1980 Getty retired from the Corps of Engineers after thirty-eight years with the Little Rock District. His professional recognition culminated in his selection to the Arkansas Board of Registration for Professional Engineers and to the National Board of Engineering Examiners. In 1982 he was selected to the Gallery of Distinguished Civilian Employees.

Clinton M. Greer

Clinton M. Greer was born on 15 March 1892. A college graduate and veteran of World War I (he was posted overseas with the 163d Depot Brigade), he served with the Corps of Engineers for twenty-eight years, twenty-three in the Little Rock District.[11]

Greer began duty with the Corps in 1932 as a temporary inspector in Kansas City. In 1933 he was a junior engineer and in 1934, after a temporary layoff, was a junior civil engineer in Omaha, Nebraska. Two years later he went to Mineral Wells, Texas, and became assistant civil engineer.

In 1937 Greer transferred to the Memphis District as assistant civil engineer, where he became familiar with the problems of the region that would become the reestablished Little Rock District. When the Little Rock District reopened in July 1937, he was one of the first employees to arrive. Two years later he received a promotion to associate civil engineer.

Much bank stabilization work was to be done in the new District. In 1941 Greer became a structural engineer. Over the next nine years he worked with the design and hydraulic professionals to improve methodology and the physical construction of various District civil works projects. In 1950 he was promoted from structural engineer for hydraulic structures to civil engineer.

In 1953 Greer was assigned as supervisory civil engineer and later as supervisory general engineer. Three years later he became supervisory general engineer of the Engineer Design Branch. At retirement on 21 December 1960, he was Chief, Design Branch. He received several commendations during his days in Little Rock. For twenty-eight years of service to the Corps, he was selected to the Gallery of Distinguished Civilian Employees in 1977.

Cleveland F. Kerry

Cleveland F. Kerry was born on 26 September 1923. During World War II, at age twenty, he joined the U.S. Marine Corps and served with the 6th Division. During hostilities he participated in the battle at Guadalcanal and the assault on Okinawa.[12]

Kerry began his federal civilian service in 1950 with a temporary appointment as civil engineer trainee with the Waterways Experiment Station in the Vicksburg District. In 1951 he received regular status as a hydraulic engineer.

In 1952 Kerry transferred to the Little Rock District. He served as construction engineer at the Barksdale Air Force Base and the next year became its general construction management engineer. He served as assistant resident engineer during the Little Rock District's major period of development and during the construction of Bossier Base, a nuclear storage facility associated with the air base. In 1961 he transferred to Pine Bluff, Arkansas.

At the Central Arkansas Resident Office from 1964 to 1968, Kerry was serving as assistant resident engineer at Pine Bluff Arsenal when the $6.6 billion Directorate of Biological Operation Facilities was being constructed. During this period he served as project engineer for the construction of Lock and Dam Number 3 in the vicinity of Swan Lake, Arkansas, a project that he remained associated with until 1978.

In 1968 Kerry joined the Operations Division, Pine Bluff Resident Office, as regional engineer for the McClellan-Kerr Arkansas River Navigation System from 1969 to 1978. He was then assigned to the U.S. Army, Europe, in Geissen, Germany, to serve as resident engineer for military construction. When this overseas assignment ended in 1981 he returned to the Little Rock District in the Construction-Operations Division.

Kerry retired in December 1981, remembered for his efforts in establishing and implementing the Little Rock District's operation and maintenance policies for the McClellan-Kerr Arkansas River Navigation System. As Pine Bluff resident engineer he received the first award presented for outstanding performance in the Equal Employment Opportunity Program.

In 1984 Kerry left retirement to serve briefly as supervising civil engineer, Engineer Division, Administrative Branch. He was named to the Gallery of Distinguished Civilian Employees in 1983 after serving with the Corps of Engineers thirty-one years, twenty-nine of which were with the Little Rock District.

Jesse Newton Masters

After a twenty-seven-year career with the Corps of Engineers, Jesse Newton Masters was recognized for his contribution to the Little Rock District by being selected to the Gallery of Distinguished Civilian Employees in 1985.[13]

Born on 10 February 1926, Masters' first government service was with the U.S. Navy from 1942 to 1946. After the war he received an executive appointment as a laborer in the Memphis District. In 1948 he received another temporary appointment as an engineer aid, also with the Memphis District. He then returned to the U.S. Navy and served from 1951 to 1952.

Masters' career with the Little Rock District began in 1954 as an engineer aid in the Engineer Division. Three years later he became a civil engineer technician. In 1958 he transferred to the Reservoir Development Section in the Operations Division. When the section received branch status in 1963, he became Chief, Management Unit. During this period he was instrumental in the selection of the original park sites for Table Rock and Greers Ferry and for the Arkansas River sites. He began to prepare and revise master plans for various projects throughout the District; his efforts were instrumental in the original success of the lakeshore management plans for Table Rock and Beaver lakes.

Because the Little Rock District was preeminent in the development of reservoir planning, Masters' work was incorporated into Corps-wide procedures for lakeshore management planning. His work was also instrumental in the early development of recreation and resource management planning before reorganization of the District office led to the establishment of different sections and branches. In 1967 he joined the Recreation Facilities Section, Operations Branch, as a recreation-resource specialist.

After further reorganization at the District level, Masters was assigned to the Recreation Management Section and in 1971 became outdoor recreation planner, Reservoir Management Section. The next year he went to the Construction-Operations Division, Project Reservoir Management Branch, in charge of the Reservoir Management Section. That year he was given charge of the Lakes and Parks Branch, Lakes Section. His growth as a recreational specialist paralleled the growth and development of recreation as an activity of the Little Rock District.

Masters received several commendations during his tenure with the Little Rock District. He also received outstanding performance ratings, superior performance ratings, and letters of commendation from various District Engineers. After another reorganization in 1973, he was assigned to the Recreation and Reservoir Management Branch, Reservoir Section. This was followed by a promotion to recreation supervisory outdoor planner in 1973.

From 1973 until his retirement on 24 April 1981, Masters developed the initial Park Ranger Training Program and created the original Citation Authority Training Program for District rangers. For these and other efforts, he was commended by the National Water Safety Congress for innovative contributions in the preparation of water safety programs throughout the Little Rock District.

Harold C. McKinney

Born on 8 February 1894, Harold C. McKinney served twenty-one years with the Corps of Engineers, eighteen in the Little Rock District.[14]

McKinney began his federal service as a land appraiser with the Federal Loan Agency, Federal Land Bank, in St. Louis, Missouri. In 1936 he transferred to Washington, D.C., where he became an examiner for the Federal Loan Agency. Before the outbreak of World War II McKinney joined the Quartermaster Corps, and in 1942 he transferred to the Corps of Engineers as a land appraiser. Later that year he left Washington for the Southwestern Division with responsibilities for the Little Rock District.

In 1945 McKinney transferred to the Little Rock District to become a land appraiser. A year and a half later he joined the Real Estate Division in the same position, which he held for the next six years. In 1953 he became real property officer, Real Estate Division, and, two years later, supervisory real property officer.

With responsibilities for the appraising and acquisition of land throughout the state of Arkansas, McKinney worked closely with his colleague William Finefield to develop methodology that was used to acquire tracts of land along the Arkansas River and at other Corps project sites.

In 1962 McKinney was promoted to realty officer and then served as Chief, Real Estate Division, until he retired on 26 April 1963. For his contributions to the District in the area of real estate acquisition, he was selected with twelve other District employees to the Gallery of Distinguished Civilian Employees in 1975.

William E. Pilcher

William E. Pilcher served in the U.S. Army before joining the Veterans Bureau in New Orleans, Louisiana, as a typist. After promotion to clerk in 1924, he transferred to the U.S. Veterans Bureau in Jackson, Mississippi. He came to the Corps of Engineers in 1926.[15]

Pilcher's thirty-seven years of service with the Corps began in the 2d New Orleans District where he served as a steward. Later that year he regained his position as a clerk. He became accounting clerk in 1932 and two years later, senior accounting clerk. After serving in the New Orleans District for eleven years he transferred to the reactivated Little Rock District in July 1937.

Pilcher, one of the first employees at the newly reopened Little Rock District, came as senior accounting clerk. Later that year he was promoted to junior administrative assistant. Four years afterward he became associate administrative assistant, then administrative assistant.

Displaying initiative on each assignment, Pilcher's assignment to administrative assistant in the Office of Comptroller, Finance and Accounting Branch, came in 1945. One year later he became fiscal accountant, a position he held until 1952.

As the District's military and civil works function grew, Pilcher grew professionally. In 1952 he became fiscal officer and in 1953 supervisory accountant. In 1961 he served as finance and accounting officer. During the next two years he also served as disbursing officer.

Pilcher, born 20 December 1903, retired as Chief, Finance and Accounting Branch, on 27 December 1963 after twenty-six years of service in the Little Rock District. In 1975 he was selected to the Gallery of Distinguished Civilian Employees.

Homer A. Rabjohn

Born on 9 December 1924, Homer A. Rabjohn first worked in the Little Rock District as a laborer in 1942. That same year he enlisted in the U.S. Navy where he served from 1942 to 1945.[16]

Rabjohn began employment with the Little Rock District in July 1950 as a civil engineer in the Hydraulics Section, Hydraulics Branch. Two years later he received a promotion and an assignment to the Soils Section, Foundations and Materials Branch. In 1952 he went to the Specifications and Estimates Section, Design Branch.

By 1960 Rabjohn was a supervisory construction management engineer in the Army Engineers Ballistic Missile Construction Office serving as Chief, Shop Drawing and Expediting Section, Construction Branch, Little Rock Area. In this position he was responsible for all shop drawing review, material expediting, and government-furnished equipment activities during the construction of the $110 million, eighteen-site missile launch facilities. For his contributions he received official commendation.

In March 1963 Rabjohn returned to the Foundations and Materials Branch. As a supervisory civil engineer he served as Chief, Foundations and Materials Branch. Under his leadership this branch grew to be the largest in the Engineering Division.

Between 1964 and 1968 Rabjohn worked on several projects including the completion of subsurface investigations testing and foundations design that were essential to the construction of the McClellan-Kerr Arkansas River Navigation Project. He also contributed to the gathering of foundation data for many of the locks, dams, and powerhouses that made up the Little Rock District portion of the navigation system; the initiation and direction of a comprehensive pile test program to develop criteria for the design and construction of locks and dams founded on sand; and coordination with the U.S. Geological Survey in preparing a comprehensive groundwater study of the Arkansas River basin. His contribution to the elimination of Lock and Dam Number 11 saved the navigation project nearly $21 million.

After several reorganizations at the District level, Rabjohn became Assistant Chief, Engineering Division, and Chief, Design Branch, in June 1978. This was the time of preparation and planning for the Conway Water Supply Project. The project's early completion was due to his motivation and sense of expediency.

Following a career of some thirty-eight years with the Little Rock District, Rabjohn retired on 29 August 1980. For his service he was selected to the Gallery of Distinguished Civilian Employees in 1984.

Wendell W. Ralphe

A native of Minnesota, Wendell W. Ralphe graduated from the University of Minnesota with a degree in civil engineering.[17]

In 1930 Ralphe was employed by the St. Paul District where he was active in the canalization of the upper Mississippi River. While serving with the St. Paul District, he received several promotions.

Ralphe's thirty-three years with the Little Rock District began when he joined the newly reestablished District in 1938. Active in a period of substantial growth for the Little Rock District, he contributed to the supervision of several of the District's civil works projects and became chief of construction in 1946.

After the Little Rock District began work on the Arkansas River Navigation Project in the 1950s—one of the largest civil works projects undertaken at that time by the Corps of Engineers—Ralphe's professional leadership and technical knowledge led to the development of engineering methods to accommodate the rapidly changing conditions of the Arkansas River. As the project neared completion in 1969, he was awarded the George W. Goethals Medal for his leadership and technical competence.

When Ralphe retired in 1971 he was Chief, Construction Division. In 1975 he was named to the Gallery of Distinguished Civilian Employees.

Edward Francis Rutt

Edward Francis Rutt was born in Chicago, Illinois, on 1 October 1907. After graduating from Lane Technical High School, he enrolled in the Armour Institute of Technology where, in 1929, he received a bachelor of science degree in civil engineering.

After employment by the Illinois Division of Highways and several construction firms in the Chicago area, Rutt began his career with the Corps of Engineers in 1933.[18] In 1934 he went to the St. Paul District to work as an inspector during construction of the locks and dams on the upper Mississippi River.

When the Little Rock District was reactivated in July 1937, Rutt transferred to Little Rock and became a junior engineer in the Engineering Division. Over the next several years he contributed to various civil works projects throughout the District. From 1946 to 1959 he was coordinator for what is now the old Veterans Administration Hospital in Little Rock, and he participated in several military projects during World War II and the Korean conflict.

As Chief, Planning Branch, from 1948 until 1951, Rutt was closely associated with the design of Norfork, Clearwater, Bull Shoals, Table Rock, Greers Ferry, and Beaver dams. As early as 1948 he directed advance engineering design studies for the McClellan-Kerr Arkansas River Navigation Project. When construction began, his contributions were instrumental in determining the success of the engineering phases of the project.

In 1961 Rutt became Chief, Engineering Division. During the next ten years he was actively involved in project studies and preparation of plans and specifications for construction projects in the District, including completion of the Arkansas portion of the McClellan-Kerr Arkansas River Navigation Project.

Rutt retired on 29 May 1971. During his thirty-eight years with the Corps of Engineers he received many performance awards, including the Meritorious Civilian Award. In 1975 he was named to the Gallery of Distinguished Civilian Employees. He died in Little Rock, Arkansas, on 21 January 1979.

Delbert A. Schmand

Delbert A. Schmand was born on 8 June 1915 in Little Rock, Arkansas. In 1937 he received a bachelor's degree in electrical engineering from the University of Arkansas. The next year he was employed by the Little Rock District, Corps of Engineers.[19]

Schmand began his service with the Little Rock District as a member of two survey crews as a subsurveyor. In this capacity he performed various duties which included chaining distances and keeping field notes. In 1939 he was promoted to junior civil engineer aid and then to assistant civil engineer aid. The next year he became Chief, Electrical and Mechanical Section, during the construction of Blue Mountain Dam.

In 1942 Schmand received a promotion to assistant electrical engineer and subsequently transferred to a military construction project as Chief, Utilities Section, for the Stuttgart Army Air Field project. In October of that year he entered the Army at Fort Monmouth, New Jersey, as second lieutenant. While in the Army between 1942 and 1946 he attended an indoctrination course at the Military Intelligence Training Center at Camp Ritchie, New Jersey; served as instructor for signal intelligence subjects; completed Command and General Staff College; and served as post signal officer at Camp Ritchie.

Schmand returned to the Little Rock District as an electrical engineer with responsibilities in the District's military assignments. In 1948 he was mechanical engineer and the next year became Assistant Chief, Specifications Section. Promotions came in 1950 to civil engineer and in 1951 to Chief, Specifications Section.

In 1953 Schmand became Assistant Chief, Design Branch. Three years later, as Chief, Design Branch, he supervised the design of locks and dams on the McClellan-Kerr Arkansas River Navigation System. In 1963 he received a promotion to Assistant Chief, Engineering Division, and aided the chief in managing other branches of the division.

Schmand's enthusiasm, professionalism, and talent for organizing and training dedicated work forces resulted in another promotion in 1967 when he was selected for the position of Chief, Operations Division. His responsibilities consisted of supervising the operation and maintenance of three flood control dams with powerhouses and twelve locks and dams on the Arkansas River.

In 1972 the Construction Division was merged with the Operations Division. Schmand became Chief, Construction-Operations Division, a position he held until his retirement in March 1974.

After retiring from the Little Rock District, Schmand became director of the Little Rock Port Authority. In 1976 he was named to the Gallery of Distinguished Civilian Employees. In 1977 he was elected president of the National Society of Professional Engineers, Washington, D.C. He lives in Little Rock, Arkansas.

Lincoln F. Sherman

Lincoln F. Sherman's career with the Little Rock District, Corps of Engineers, spanned more than two and a half decades, from July 1937 to July 1963. His knowledge and ability displayed in the construction of dams throughout the District led to his being selected to the Gallery of Distinguished Civilian Employees in 1975.[20]

Born in McComb, Mississippi, on 3 December 1906, Sherman received an engineering degree from the University of Mississippi at Oxford in 1929. During the summers of his college days he was temporarily employed by the Vicksburg District as an inspector. His duties included surveys for dredge work to clear channels.

In 1932 Sherman returned to the Corps and was assigned to the Memphis District's 3d Field Office at Helena, Arkansas, as a subinspector. Included in his responsibilities was inspection of levee construction. He became inspector of levees and dikes within the boundaries of the Memphis District. Two years later he became junior civil engineer.

After the floods of 1937 Sherman went to Gregory, Arkansas, on the Little Red River. When the Little Rock District was reactivated in July 1937, he was one of its first employees.

When Sherman arrived in Little Rock his assignment was junior civil engineer in the Engineering Division. During the next

four years he was actively involved in the planning of several construction projects. In April 1941 he moved from the Little Rock office to Mountain Home where he remained for the next thirteen years. His promotion to assistant engineer came as he was assigned to the Norfork Dam project, which involved construction of the dam and powerhouse.

In 1942 Sherman became associate engineer and in 1944, civil engineer. Two years later he transferred to the Bull Shoals Dam project. As the District continued its dam construction through the late 1940s and early 1950s, his expertise in heavy construction grew. He became construction engineer for dams in 1950. In 1954, when he left Mountain Home for Branson, Missouri, where construction of a dam and powerhouse at the Table Rock site was beginning, he became supervisory construction engineer.

With completion of his work at Table Rock, Sherman moved to Heber Springs, Arkansas, where Greers Ferry Dam was being built. His next move was to Russellville, Arkansas, where he was supervisory construction engineer during the Dardanelle Lock and Dam project.

In July 1963 Sherman transferred from the Corps of Engineers to the U.S. Section of the International Boundary and Water Commission at El Paso, Texas. For the next six years he served as a construction engineer on Amistad Dam near Del Rio on the Rio Grande River.

Lincoln Sherman retired in 1969 and returned to Little Rock, Arkansas.

Flournoy W. "Nippy" Sims

Flournoy W. "Nippy" Sims was born in Little Rock, Arkansas, on 20 January 1912. He received a degree in chemical engineering from the University of Arkansas and began work for the Corps of Engineers in 1938.[21]

Later Chief, Foundations and Materials Branch, Sims' first position with the Little Rock District was as a soil laboratory helper. When he received regular status with the District, he was assigned as a junior chemical engineer. In 1941 he went as an engineer to the Foundations and Materials Branch. His promotion to assistant civil engineer followed the next year.

During World War II when District activities increased, Sims' contributions were recognized and he rose rapidly in the Foundations and Materials Branch. After the war he became soils mechanical engineer and in 1948, materials engineer.

In 1950 Sims became supervising structural engineer for the Foundations and Materials Branch. As the District's civil works mission continued to expand, his efforts on behalf of the District advanced the methodology of the Foundations and Materials Branch. He became Chief, Foundations and Materials Branch, Engineer Division, in 1956.

A member of the American Society of Civil Engineers and the U.S. Committee on Large Dams, Sims received commendations several times during his twenty-six years with the Little Rock District. Sims died on 16 September 1964 in Little Rock and was selected to the Gallery of Distinguished Civilian Employees in 1975.

Jesse W. "Bill" Story

A former resident engineer in charge of Table Rock, Beaver, Dardanelle, and Ozark dams and Lock and Dam Number 13, Jesse W. "Bill" Story served thirty-six years with the Corps of Engineers, thirty-five years in Little Rock District.[22]

Story, a college graduate, was born 29 March 1912. In 1941 he went to work for the Quartermaster Corps in Sterline, Louisiana, as an assistant civil engineer. That year he transferred to the Corps of Engineers and relocated to Atlanta, Georgia.

In January 1942 Story transferred to the Vicksburg District as assistant civil engineer; in December of that year he was assigned to the Little Rock District. During World War II he served until 1946 in the U.S. Army. After mustering out of the service he returned to the District as a civil engineer.

Becoming more and more involved in dam construction, Story became construction management engineer for dams in 1950. Two years later he became construction management engineer general. That same year he was given charge of duty post as supervisory construction engineer.

As dam construction increased in the District in the 1950s, Story's expertise resulted in rapid promotion. After temporary duty at the Pine Bluff Arsenal in 1952, he became supervisory construction engineer (airfields), Construction Division, at the Table Rock Project Office in Branson, Missouri, in 1954. Another promotion, to supervisory construction engineer (dams), came the next year.

In 1960 Story was made supervisory construction engineer at the Beaver Dam Resident Office in Eureka Springs, Arkansas. When construction ,began on the Arkansas River project, he transferred to the Dardanelle Resident Office. In 1965 he was transferred to the Ozark Resident Office, Ozark, Arkansas.

On 14 October 1977 Jesse Story retired. His contributions to the construction of the locks and dams on the Arkansas River, as well as to the construction of some of the District's high-dam sites, led to his being selected to the Gallery of Distinguished Civilian Employees in 1980.

Herman Clay West

Born in Farmington, Kentucky, on 3 December 1911, West began service in the Corps of Engineers in 1932 with a probationary appointment in the Memphis District as an under clerk. In 1936 he transferred to Tucumcari, New Mexico, with the Canche District and was promoted to clerk. After his transfer to Little Rock in 1937 he became senior clerk. He was one of the original employees who opened the Little Rock District office in the old Cotton Exchange Building on the corner of Second and Scott.[23]

As the District began to do flood control and bank stabilization work, West's contributions led to several promotions: in 1941 to principal clerk, in 1942 to junior administrative assistant, and in 1943 to associate administrative assistant. From 1943 to 1945 he was on active duty in the U.S. Navy Reserve.

After the war West returned to Little Rock and the Corps of Engineers and received a promotion to administrative assistant. The next year he was assigned to the Supply Branch. Two years later he was made property and supply officer and the next year, property and supply supervisory officer.

Charged with obtaining services for the District, West was largely responsible for seeing that contractors completed their work for the District. As a result of his efforts, he received a promotion to supply officer in 1952 and five years later to supply and procurement officer.

As the ground was broken in the 1950s and 1960s for the Arkansas River Navigation Project the tasks of contracting and procurement increased for the Supply Division. As Chief, Supply Division, West was largely responsible for open bidding, gathering of all relevant specifications for Corps projects, and seeing contracts to their successful completion.

Herman West died on 24 March 1969. For his thirty-seven years of service with the Corps of Engineers, thirty-two of which were spent in Little Rock, West was selected to the Gallery of Distinguished Civilian Employees in 1975.

Appendix III

Locking Procedures

River improvement engineers use locks and dams to create slack-water navigation systems. The dams create a series of pools deep enough for navigation throughout their entire length. The water in each pool is deepest at the end nearest the dam that creates the pool and shallowest downstream at the next dam in the series. Although the minimum depth of water in each pool is approximately equal, the bottom of each pool is at a higher elevation than the pool immediately downstream from it. The pools create a water stairway. Vessels travel from pool to pool by the use of locks, which can be thought of as water elevators to carry vessels up or down between pools. Locks have massive fixed sides and large moveable gates at each end. When closed, the gates create the equivalent of an elevator "car" that uses water to carry vessels up or down.

To move up the river from a lower elevation to a higher one, a vessel enters the pool (lock chamber) at the lower level while the upstream gates are closed. The water in the lock chamber is then at the level of the lower pool because the chamber constitutes an extension of the lower pool at that time. When the vessel is inside the chamber, the downstream gate is closed behind it. Water from the upper pool is then allowed to flow by gravity through valves in the upstream gate into the lock chamber until the water level in the chamber and the vessel riding on that water are at the level of the water in the upper pool. The upstream gate is then opened, and the vessel moves out into the upper pool.

To move a vessel from a higher elevation to a lower one the procedure is reversed. With the downstream gate closed, the vessel moves into the lock chamber. The water level in the lock chamber is the same as that in the upper pool because now the chamber constitutes an extension of the upper pool. When the vessel is inside the chamber, the upstream gate is closed behind it. The water in the chamber is permitted to drain out of the downstream gate through valves, and the vessel is lowered as the water level declines. When the level of water in the chamber reaches that of the lower pool, the downstream gate is opened, and the vessel moves out into the lower pool.

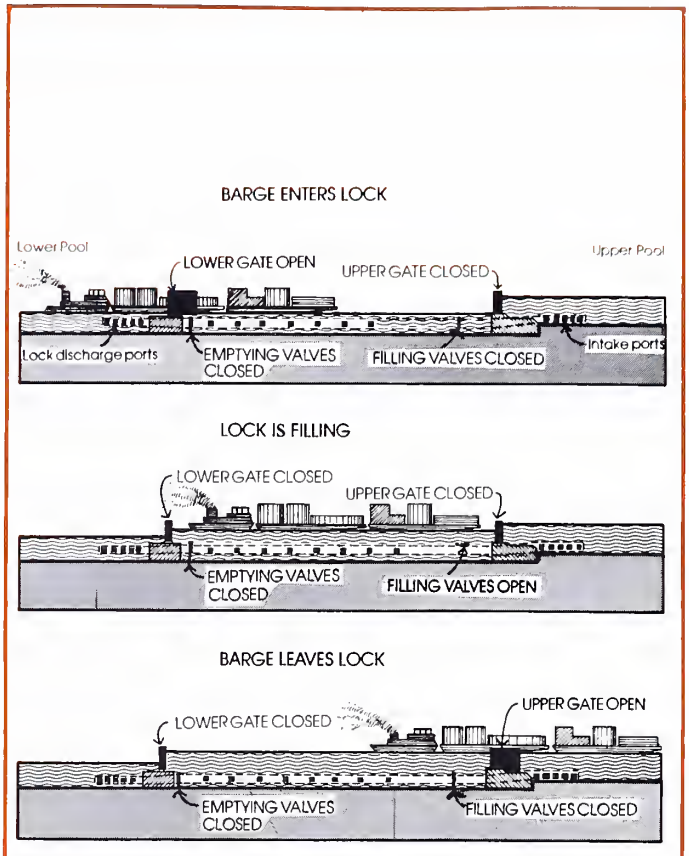


ILLUSTRATION 126. How a lock works.

Notes

Chapter I

1. Circular Letter from the Office of the Chief of Engineers, 25 March 1913, Letters Sent, Office of the Chief of Engineers (OCE), Record Group (RG) 77, National Archives (NA), Washington, DC (collection hereafter cited as Letters Sent, OCE, RG 77); W. Stull Holt, *The Office of Chief of Engineers of the Army: Its Non-Military History, Activities, and Organization* (Baltimore: Johns Hopkins Press, 1923), pp. 11-17; Paul W. Thompson, *What You Should Know About the Army Engineers* (New York: W.W. Norton & Co., 1942), pp. 194-198. Although we found no statements altering this policy (1985 Corps arguments, commentary, and legislative lobbying stress this policy and its validity), since 1980 the Corps has altered the boundaries of Districts in ways that do not conform to this policy. For example, the 1980 expansion of the Little Rock District created boundaries based more on existing political boundaries than on river basins. The section of mid-Red River basin transferred to the Little Rock District was defined on the basis of state boundaries. This was also the case in the redelineation of the District's western boundary to coincide with the western boundaries of the states of Arkansas and Missouri. Examples of this tendency in boundary realignment are not isolated to the Little Rock District.

2. A recent analysis of Arkansas geography and its implications are contained in Hupert B. Stroud and Gerald T. Hanson, *Arkansas Geography: The Physical Landscape and the Historical Cultural Setting* (Little Rock: Rose Publishing Co., 1981). An older study is John H. Hineman, *The Geography of Arkansas* (Chicago: Rand McNally & Co., 1908). A recent examination of Missouri geography is provided in Milton D. Rafferty, *Missouri, A Geography* (Boulder, CO: Westview Press, 1983). An older relevant study is Carl Sauer, *The Geography of Ozark Highlands of Missouri* (Chicago: University of Chicago Press, 1920).

3. This span of 12,000 years of human occupation in Arkansas is fairly widely accepted. Evidence exists that human habitation occurred in other areas of the United States as early as 20,000 years ago; however, because no specific evidence of human occupation in Arkansas before 12,000 years ago has been discovered, this more recent time is generally used [Hester A. Davis, "History of Archeological Research in Arkansas," in Hester A. Davis, ed., *State Plan for the Conservation of Archeological Resources* (Fayetteville, AR: Arkansas Archeological Survey, Series No. 21, 1982), p. 13].

4. W.J. Bennett, Jr., and Jack H. Ray, *Cultural Resources Survey at Selected Locations: Table Rock Lake, Missouri and Arkansas* (Little Rock: U.S. Army Engineer District, 1986), pp. 21-22; Dan F. Morse and Phyllis A. Morse, *Archeology of the Central Mississippi Valley* (New York: Academic Press, 1983), pp. 51-68; Carl H. Chapman, The Archeology of Missouri, vol. 1, (Columbia, MO: University of Missouri Press, 1975), pp. 60-93.

5. Bennett and Ray, *Table Rock*, p. 22; Morse and Morse, *Central Mississippi Valley,* pp. 71-95; Chapman, *Archeology of Missouri,* pp. 95-126.

6. Bennett and Ray, *Table Rock,* pp. 22-24; W.J. Bennett, Jr., Anne Frances Gettys, Aubra Lee, Lawson Smith, and Beverly Watkins, *Archeology in the Arkansas River Valley: A Cultural Resources Survey in the Central Arkansas River Valley, Lake Dardanelle and Ozark Lake, Arkansas* (Little Rock: U.S. Army Engineer District, 1986), pp. 39-41; Morse and Morse, *Central Mississippi Valley,* pp. 99-137; Chapman, *Archeology of Missouri,* pp. 127-224.

7. Mark R. Harrington, "The Ozark Bluff Dwellers," *American Anthropologist* 26 (1924):1-21; Harrington, *The Ozark Bluff Dwellers* (New York: Museum of the American Indian, Heye Foundation, 1960); Charles E. Cleland, "Analysis of the Animal Remains in the Prehistoric Ozark Bluff-Dwelling of Northwestern Arkansas" (M.A. thesis, University of Arkansas, 1960); Walker M. Winslow, "The Cave Culture of Arkansas," in *Explorations and Field Work of the Smithsonian Institution*, 1932, pp. 159-168.

8. George Szabo III, "A Preliminary Investigation of Mississippian Adaptations in the Arkansas Ozarks," unpublished manuscript [Little Rock District Archeologist Robert Dunn dates this report as 1981], copy in District Archeologist's File, Little Rock District, Corps of Engineers, Little Rock (collection hereafter cited as District Archeologist's Files, Little Rock District).

9. For further information, see Bruce D. Smith, ed., *Mississippian Settlement Patterns* (Orlando, FL: Academic Press, 1978); John R. Swanton, *The Indians of the Southeastern United States* (Washington, DC: Bureau of American Ethnology Bulletin 137, 1946; reprinted 1979); Charles R. Hudson, *The Southeastern Indians* (Knoxville: University of Tennessee Press, 1976); and Anastasius Donay, "Narrative of LaSalle's Attempt to Ascend the Mississippi in 1687," in John Gilmary Shea, ed., *Discovery and Exploration of the Mississippi Valley* (New York: Redfield, 1852), pp. 217-220.

10. For further information, see William B. Glover, "A History of the Caddo Indians," *Louisiana Historical Quarterly* 18 (1935); Clarence H. Webb and Hiram F. Gregory, *The Caddo*

Indians of Louisiana, 2d ed. (Baton Rouge: Department of Culture, Recreation and Tourism, Louisiana Archeological Survey and Antiquities Commission, 1986); John R. Swanton, *Source Material on the History and Ethnology of the Caddo Indians* (Washington, DC: Bureau of American Ethnology Bulletin 132, 1942); Swanton, *Indians of the Southeast;* and Hudson, *Southeastern Indians.*

11. "Narrative of the Expedition of Hernando DeSoto, By the Gentleman of Elvas," in F.W. Hodge and Theodore H. Lewis, eds., *Spanish Explorers in the Southern United States, 1528-1543* (New York, Charles Scribner's Sons, 1907), p. 133.

12. Timothy Severin, *Explorers of the Mississippi* (New York: Alfred A. Knopf, 1968), p. 50.

13. Ibid.

14. "Narrative of the Expedition of Hernando DeSoto," in Hodge and Lewis, *Spanish Explorers,* p. 216.

15. Sources conflict on the route of the De Soto expedition. De Soto and his men did not have an accurate idea of where they were, hence many interpretations of the vague and clearly confused account of the trip are possible. This account is drawn from "Narrative of the Expedition of Hernando DeSoto," in Hodge and Lewis, Spanish Explorers, pp. 205-222; Fay Hempstead, *A History of the State of Arkansas* (New Orleans: F.F. Hansell & Bros., 1889), pp. 29-41; Harry Ashmore, *Arkansas: A History* (New York: W.W. Norton & Co., 1978), p. 5; Katherine Bakeless and John Bakeless, *Explorers of the New World* (London: G. Bell & Sons, 1957), p. 53; and Severin, *Explorers,* pp. 56-59.

16. Voluminous literature is available on this general subject. This narrative relies primarily on Norman W. Caldwell, *The French in the Mississippian Valley, 1740-1750* (Urbana: University of Illinois Press, 1941);J.M.S. Careless, "Frontierism, Metropolitanism and Canadian History," *Canadian Historical Review* 35 (1954):1-21; John Anthony Caruso, *The Mississippi Valley Frontier: The Age of French Exploration and Settlement* (New York and Indianapolis: Bobbs-Merrill Co., 1966); William J. Eccles, *The Canadian Frontier, 1534-1760* (New York: Holt, Rinehart & Winston, 1969); J.H. Schlarman, *From Quebec to New Orleans* (Belleville, IL: Buechler Publishing Co., 1929); and Raymond H. Merritt, *Creativity, Conflict and Controversy: A History of the St. Paul District U.S. Army Corps of Engineers* (St. Paul: U.S. Army Engineer District, 1980), pp. 15-18.

17. Harold A. Innis, *The Fur Trade in Canada* (New Haven, CT: Yale University Press, 1962), p. 113.

18. Eccles, *Canadian Frontier,* p. 101.

19. Severin, *Explorers,* pp. 75-76.

20. There is some confusion as to whether the Joliet and Marquette band stopped at an Indian village at the confluence of the Arkansas and Mississippi rivers or one farther north at the St. Francis and the Mississippi. On one Marquette map the village is marked on the east side of the Mississippi across from the mouth of the Arkansas; on another it is marked on the west side near the confluence of the Arkansas and the Mississippi. For more information, see Caruso, *Mississippi Frontier*, p. 84.

21. George E. Hyde, *Indians of the Woodlands from Prehistoric Times to 1725* (Norman: University of Oklahoma Press, 1962), pp. 155-175.

22. Zenobius Membre, "Narrative," in Shea, *Discovery,* pp. 169-170. Biographical information on La Salle and narratives of his explorations abound. This study draws primarily on Francis Parkman, *LaSalle and the Discovery of the Great West* (Boston: Little Brown & Co., 1919); John Upton Turell, *LaSalle: The Life and Times of an Explorer* (New York: Weybright & Talley, 1968); Caruso, *Mississippi Frontier,* pp. 159-182 and 201-224; and Severin, *Explorers,* pp. 102-161.

23. Joseph Wallace, *The History of Illinois and Louisiana Under French Rule* (Cincinnati: R. Clarke & Co., 1893), p. 80.

24. Less information is available on Tonti. This narrative draws on Parkman, *LaSalle;* Severin, *Explorers,* pp. 162-184; and Edmund Robert Murphy, *Henry de Tonti: His Exploits in the Valley of the Mississippi* (Baltimore: Johns Hopkins Press, 1941).

25. Severin, *Explorers,* p. 163.

26. Boyd W. Johnson, "John Law and His Colony on the Arkansas," *Grand Prairie Historical Society Bulletin* 4 (Oct. 1963):58-60.

27. Jack L. Holmes, "Some French Engineers in Spanish Louisiana," and Samuel Wilson, Jr., "Colonial Fortification and Military Architecture in the Mississippi Valley," both in John F. McDermott, ed., *The French in the Mississippi Valley* (Urbana: Illinois University Press, 1965), pp. 103-142; Leland R. Johnson, *The Falls City Engineers: A History of the Louisville District, Corps of Engineers, United States Army* (Louisville, KY: U.S. Army Engineer District, 1974), pp. 8-9.

28. Lawrence Kinnard, "American Penetration into Spanish Louisiana," in *New Spain and the Anglo-American West: Historical Contributions, Presented to Herbert Eugene Bolton* (Los Angeles: Privately printed, 1931). For a good general history of the Corps of Engineers during 1794-1818, see *The History of the US Army Corps of Engineers* (EP 360-1-21) (Washington, DC: Historical Division & Public Affairs Office, HQ, U.S. Army Corps of Engineers, 1986), pp. 21-27.

29. Federal Writers Program, United States, Works Progress Administration, *Arkansas, A Guide to the State* (New York: Hastings House, 1958), p. 37.

30. Ibid., p. 67.

31. Ibid., p. 58.

32. The most prominent author initially presenting this thesis as it applies to the entire trans-Mississippi West was William H. Goetzmann in his excellent works, *Army Exploration in the American West, 1803-1863* (New Haven, CT: Yale University Press, 1959) and *Exploration and Empire: The Explorer and Scientist in the Winning of the American West* (New York: Alfred A. Knopf, 1966). The same theme of the civil applications of American military activity was simultaneously being developed by Francis Paul Prucha in his path-breaking studies, "The Settler and the Army in Frontier Minnesota," *Minnesota History* 29 (1948):231-246; *Broadax and Bayonet: The Role of the U.S. Army in the Development of the Northwest, 1815-1860* (Madison: University of Wisconsin Press, 1953); *American Indian Policy in the Formative Years* (Cambridge, MA: Belknap Press, 1962); and *The Sword of the Republic: The United States Army on the Frontier, 1783-1846* (London: Macmillan & Co., 1969).

33. James Wilkinson was born to an affluent family on a plantation in Maryland. By the time he was eighteen years old he had finished his education and was practicing medicine in Maryland. In 1775 he joined the Continental Army and, without any particularly notable military service, achieved in his early twenties the rank of brigadier general. He did, however, participate in the Battle of Saratoga along with Aaron Burr and Benedict Arnold. Following the war, Wilkinson made a fortune in business in Philadelphia and Kentucky before journeying to New Orleans in 1787. There he bribed his way into the acquaintance of several high-placed Spanish officials whom he convinced that some of the western American settlements were discontented with their new government and might secede and attack Spanish possessions in North America. He convinced the Spanish officials to

pay him with cash and trading rights to try to convince certain westerners to seek the benefit of Spanish rule rather than attack and try to take over Spanish colonies. Meanwhile, in 1791 Wilkinson rejoined the American Army, rapidly rising to the rank of major general. This made him more valuable as a Spanish spy. With the transfer of Louisiana to France, Wilkinson's days as a Spanish spy were numbered. After the Louisiana Purchase he served briefly as a double agent for the Americans and the Spanish who were unhappy with the transfer of the area to the United States. Wilkinson next made a secret alliance with his old wartime comrade, Aaron Burr, then president of the Senate and Vice President of the United States. Wilkinson needed Burr's assistance in getting his nomination as governor of the Louisiana Territory confirmed. Although the intent is unclear, Wilkinson was clearly deeply involved in Burr's subsequent attempt to liberate the Spanish provinces of the Southwest and perhaps separate the western states from the Union. Wilkinson betrayed the scheme to President Jefferson and served as a state witness against Burr in his 1807 trial. Wilkinson remained in the Army until 1815 but never again held a prominent position. [James Ripley Jacobs, *The Tarnished Warrior* (New York: Macmillan Co., 1938); Royal Ornan Shreve, *The Finished Scoundrel* (Indianapolis: Bobbs-Merrill Co., 1933); Walter Flavius McCalib, *The Aaron Burr Conspiracy* (New York: Wilson-Enkson, Inc., 1936); W. Eugene Hollon, *The Lost Pathfinder: Zebulon Montgomery Pike* (Norman: University of Oklahoma Press, 1949), pp. 43-53].

34. Wilkinson's original letter of instructions is in the War Records Division of the National Archives. The version drawn upon here is contained in Hollon, *Lost Pathfinder,* pp. 101-102.

35. Hollon, *Lost Pathfinder,* pp. 102-122. Prior to Wilkinson's mission, no one had traveled up the Arkansas in a boat as much as 250 miles, and no one had gone up its valley more than 500 miles.

36. Federal Writers Program, *Arkansas,* p. 37; Ellen Lloyd Trover and William F. Swindler, eds., *Chronology and Documentary Handbook of the State of Arkansas* (New York: Oceana Publications, 1972), p. 3.

37. Roger L. Nichols and Patrick L. Halley, *Stephen Long and American Frontier Exploration* (Newark: University of Delaware Press, 1980), pp. 26-28; Richard G. Wood, *Stephen Harriman Long, 1784-1864, Army Engineer, Explorer, Inventor* (Glendale, CA: A.H. Clark Co., 1966), pp. 46-47.

38. Brigadier General Henry L. Abbot, "The Corps of Engineers," *Journal of the Military Service Institution* 15 (Mar. 1894):414-425; Henry P. Beers, "A History of the U.S. Topographical Engineers, 1813-1863," *Military Engineer* 34 (1942):287-291, 348-352; William M. Robinson, "The Corps of Topographical Engineers," *Military Engineer* 23 (July-Aug. 1931):303-307.

39. Wood, *Long,* pp. 59-84; Louis B. Wright and Elaine W. Fowler, eds., *The Moving Frontier* (New York: Delacorte Press, 1972), pp. 252-253.

40. Information on the unimproved fort site is contained in U.S. Army Engineer District, Tulsa, "Historical Data on Arkansas River" [unpublished manuscript, May 1960, copy in Box 209, Records Management Office, Little Rock District, Corps of Engineers, Little Rock (collection hereafter cited as Box 209, Little Rock District)]. Some of the construction history of Fort Smith is covered in Bruce A. Anderson's *Archeological Test Excavations for Portions of the Walls of the 2nd Fort, Fort Smith National Historical Site, Fort Smith Arkansas* (Santa Fe, NM: Southwest Cultural Resources Center, National Park Service, 1979/1981) and in Joekson W. Moore, Jr.'s *The Archeology of Fort Smith I: Fort Smith National Historic Site* (Atlanta: National Park Service, Southeast Region, 1963). See also William J. Butler, *Fort Smith, Past and Present, A Historical Summary* (Fort Smith, AR: First National Bank, 1973).

41. Trover and Swindler, *Arkansas,* p. 6.

Notes

Chapter II

1. Early descriptions include those from the De Soto, Joliet, and Marquette, La Salle, and Tonti expeditions ("Narrative of the Expedition of Hernandez DeSoto," in Hodge and Lewis, *Spanish Explorers;* Membre, "Narrative"; Donay, "Narrative"; Parkman, *LaSalle;* and Murphy, *Tonti*).

2. Although much has been written about the post-1819 steamboat era and some on the 1802-1842 keelboat and flatboat era, secondary studies of pre-1800 waterborne transportation specifically applicable to the region do not exist. This topic offers excellent opportunities for future scholarly research. Much of the description here is based on W. Wallace Carson, "Transportation and Traffic on the Ohio and Mississippi before the Steamboat," *Mississippi Valley Historical Review* 7 (June 1920):33-35, and Dale Van Every, *Ark of Empire: The American Frontier, 1784-1803* (New York: William Morrow & Co., 1963).

3. Leland D. Baldwin, *The Keelboat Age on Western Waters* (Pittsburgh: University of Pittsburgh, 1941), pp. 1-45; Duane Huddleston, "Early White River Keelboating and Flatboating: 1802-1842," *Stream of History* 17 (July-Oct. 1979):3-30.

4. Margaret Ross, "Steamboat *Comet* Makes Historic Trip—Opens Navigation Up to Arkansas Post," *Arkansas Gazette,* 1 Sept. 1965. Literature on steamboating in the area now under the jurisdiction of the Little Rock District is voluminous. For general studies that include information on this area see Louis Hunter's *Steamboats on the Western Rivers, An Economic and Technological History* (Cambridge, MA: Harvard University Press, 1949) and Oscar Osburn Winther's *The Transportation Frontier, Trans-Mississippi West 1865-1900* (New York: Holt, Rinehart & Winston, 1964), pp. 74-92.

5. Margaret Ross, "First Steamboats Reach Little Rock in '22 on Way to Dwight Mission, Fort Smith," *Arkansas Gazette,* 26 Sept. 1965.

6. Two excellent works by George Dangerfield provide good overviews of these developments and the period in general: *The Era of Good Feelings* (New York: Harcourt, Brace & Co., 1952) and *The Awakening of American Nationalism* (New York: Harper & Row Publishers, 1965).

7. Henry Clay, "Speech on Internal Improvements," 14 Jan. 1824, in James F. Hopkins and Mary W. Hargreaves, eds., *Presidential Candidate, 1821-1824,* vol. III in *Papers of Henry Clay* (Lexington: University of Kentucky, 1963), pp. 572-593.

8. The most important decisions of the Marshall Court are discussed in J.A. Garraty, ed., *Quarrels That Have Shaped the Constitution* (New York: Harper & Row Publishers, 1964).

9. Marshall's career is described in laudatory terms in A.J. Beveridge, *The Life of John Marshall* (Boston: Houghton Mifflin Co., 1916). A more critical account is found in E.S. Corwin, *John Marshall and the Constitution* (Princeton, NJ: Princeton University Press, 1919).

10. *U.S. Statutes at Large,* vol. 4, p. 32.

11. Ibid., p. 33.

12. The most noteworthy exceptions are the 26th Congress (1839-1841), the 29th through 31st Congresses (1845-1851), the 33d through 38th Congresses (1853-1865), the 92d Congress (1971-1973), and the 94th through 97th Congresses (1975-1983).

13. In the period between 1838 and 1865 the Corps referred to was the Corps of Topographical Engineers rather than the Corps of Engineers. Similarly, the Chief Engineer referred to in the period between 1838 and 1865 was the Chief of Topographical Engineers rather than the Chief of the Corps of Engineers.

14. Johnson, *Louisville District,* p. 44.

15. Forest Garrett Hill, in his *Roads, Rails and Waterways: The Army Engineers and Early Transportation* (Norman: University of Oklahoma Press, 1957), provides a history of the Board of Internal Improvements and its activities.

16. Hill, *Roads, Rails and Waterways,* pp. 59-60.

17. Report, Alexander Macomb to Speaker of the House Andrew Stevenson, 3 Mar. 1828, pp. 525, 529, vol. III, Series 250, RG 77, NA, Washington, DC (hereafter cited as Macomb to Stevenson, 3 Mar. 1828, Series 250, RG 77).

18. Macomb to Stevenson, 3 Mar. 1828, pp. 526, 531, Series 250, RG 77.

19. *U.S. Statutes at Large,* vol. 4, p. 289.

20. Federal Writers Program, *Arkansas,* p. 322.

21. E.C. Barker's *Mexico and Texas* (Dallas: P.L. Turner Co., 1928) and *Life of Stephen Austin* (Nashville: Cokesburry Press, 1925) discuss American migration into Texas. W.C. Binkley's *The Texas Revolution* (Baton Rouge: Louisiana State University Press, 1952) and Marquis James' *The Raven* (Indianapolis: Bobbs Merrill Co., 1929) are standard accounts of the Texans' struggle for independence.

22. *U.S. Statutes at Large,* vol. 4, p. 32; Johnson, *Louisville District,* pp. 46-55.

23. Florence L. Dorsey, *Master of the Mississippi, Henry*

Shreve and the Conquest of the Mississippi (Boston: Houghton Mifflin Co., 1941).

24. Beers, "History of the U.S. Topographical Engineers," *Military Engineer,* pp. 287-291, 348-352; Robinson, "Corps of Topographical Engineers," *Military Engineer,* pp. 303-307.

25. U.S. Congress, Senate, *Message from the President of the United States to the Two Houses of Congress,* S.D. 1, 25th Cong., 3d sess., 1839, vol. I, p. 107.

26. Dorsey, *Shreve;* Johnson, *Louisville District,* pp. 76-77.

27. *U.S. Statutes at Large,* vol. 4, p. 553.

28. Henry Vose to John C. Calhoun, "Plans for Removal of Obstructions in the Mississippi and Ohio Rivers," 10 Aug. 1824, RG 77, NA, Washington, DC.

29. Interview, Floyd M. Clay with Raymond Boyle, 30 June 1967, transcript in Box 209, Records Management Office, Little Rock District (hereafter cited as Boyle interview). (Clay's interviews used in this study are taken from these transcripts.)

30. Johnson, *Louisville District,* p. 46.

31. "A Survey of the Arkansas River in 1833 by Lt. T.S. Brown, U.S. Engineers," subsheet 10, drawer 123, sheet 1 consisting of subsheets 1-19, RG 77, NA, Washington, DC.

32. U.S. Army Engineer District, Little Rock, Arkansas, "The Arkansas Renaissance of a River," unpublished manuscript, no date, p. 4, copy in District Library files, Little Rock District, Corps of Engineers, Little Rock (hereafter cited as "Renaissance of a River"; collection hereafter cited as District Library files, Little Rock District).

33. Martin Van Buren was one of the most talented politicians in American history. His positions are often hard to determine not only because, like the consummate politician he was, he never took a position if he could avoid doing so, but also because he held that issues were means, not ends, in the world of politics. However, when pinned down, he basically approached most questions rationally and pragmatically. For further information on Van Buren's policies, see R.V. Remini, *Martin Van Buren and the Making of the Democratic Party* (New York: Columbia University Press, 1959); J.C. Fitzpatrick, ed., *Martin Van Buren's Autobiography* (Seamen, OH: Kelly Publications, 1920); and Joseph H. Harrison, Jr., "Martin Van Buren and His Southern Supporters," *Journal of Southern History* 22 (Nov. 1956): 438-458.

34. Merritt, *St. Paul District,* pp. 44-45; Johnson, *Louisville District,* p. 88.

35. There are many easily accessible and relatively brief accounts of the Mexican War, including A.H. Bill's *Rehearsal for Conflict* (New York: History Book Club, 1947) and R.S. Henry's *The Story of the Mexican War* (Indianapolis: Bobbs Merrill Co., 1950).

36. During the 1830s the French developed new technology that allowed the placement of locks and dams in rivers. They designed structures that would not necessarily be washed away by river flooding. During the same decade the state of Ohio began having locks and dams built on the Muskingum River; the Commonwealth of Kentucky had locks and dams built on the Green and Kentucky rivers; and the Monongahela Navigation Company, a private corporation, started building a series of locks and dams on the Monongahela River. It was not until 1842 that Captain George W. Hughes of the Topographical Engineers studied the creation of a slack-water navigation system on the Ohio River. The Davis Island Lock and Dam was the pioneer slack-water project on the Ohio; construction began in 1878 and was completed in 1885 [Johnson, *Louisville District,* pp. 98-99, 142-143, 147-148; Leland R. Johnson, *The Davis Island Lock and Dam 1870-1922* (Pittsburgh: U.S. Army Engineer District, 1985), pp. 8-9, 13, 16; Hunter, *Steamboats on the Western Rivers,* pp. 206-212].

37. See Note 36 above; Frederick J. Dobney, *River Engineers in the Middle Mississippi: A History of the St. Louis District of the Corps of Engineers* (St. Louis, MO: U.S. Army Engineer District, 1978), pp. 77-79; John R. Ferrell, "Water Resources Development: The Role of the Army Engineers, 1824-1930," copy in manuscript file, Office of History, Office of the Chief of Engineers, Fort Belvoir, VA (collection hereafter cited as Manuscript file, Office of History, OCE); Arthur E. Morgan, *Dams and Other Disasters: A Century of the Army Corps of Engineers in Civil Works* (Boston: Porter Sargent, 1971), pp. 254-256; Arthur D. Frank, *The Development of the Federal Power of Flood Control on the Mississippi River* (New York: Columbia University Press, 1930), p. 25. Charles S. Ellet, Jr., a leading civilian engineer, was the major 1850s proponent of the creation of artificial reservoirs on tributary streams as an alternative method of both maintaining adequate depth for navigation on the principal federally improved rivers and controlling the flooding from the principal federally improved rivers. Ellet explained his theories in two pamphlets: *The Mississippi and Ohio Rivers* (Philadelphia: Lippincott, Grambo, & Co., 1853) and *Report on the Improvement of the Kanawha and Incidentally of the Ohio River, by Means of Artificial Lakes* (Philadelphia: Collins, 1859). The principal contemporary engineer opposing Ellet's ideas in terms of methods and technologies appropriate for federal waterway navigation improvements was William Milnor Roberts, a civilian engineer who later, in the late 1860s, served as superintendent of Ohio River improvements for the Corps of Engineers. Roberts' critique of Ellet's theories is summarized in an article by Roberts' son and colleague Thomas P. Roberts in "Floods and Means of Their Prevention in Our Western Rivers," *Proceedings of Engineers' Society of Western Pennsylvania* 23 (July 1907):315. The principal contemporary engineers opposing Ellet's ideas in terms of flood control were Topographical Engineers Colonel Stephen H. Long and Captain Andrew A. Humphreys. Their critique of Ellet's theory is contained in a subsequent publication, A.A. Humphreys and H.L. Abbot, *Report Upon the Physics and Hydraulics of the Mississippi River* (Washington, DC: Government Printing Office, 1861).

38. Humphreys and Abbot, *Physics and Hydraulics of the Mississippi River.*

39. Such construction was first authorized in the Rivers and Harbors Act of 1917. Although the Corps through the Mississippi River Commission's establishment in 1879 had been charged with preventing destructive floods on the Mississippi River, it was not until Congress passed this act that the Congress authorized the Corps to build levees for flood control along that reach of the Mississippi River between the mouth of the Ohio River and Rock Island, Illinois.

40. Ella H. Ellwanger, "Famous Steamboats and Their Captains in Western and Southern Waters," *Register of Kentucky State Historical Society* 18 (Jan. 1920):21-29; Johnson, *Louisville District,* p. 89.

41. U.S. Congress, House, *Message from the President to the Two Houses of Congress,* H.D. 2, 29th Cong., 1st sess., 1845, pp. 348-349; Stephen H. Long to J.J. Albert, 14 and 24 April 1845, Letters and Reports Sent by the Office of Improvements on the Western Rivers, RG 77, NA, Washington, DC (collection hereafter cited as Letters Sent, Office of Western Rivers, RG 77); Johnson, *Louisville District,* pp. 78, 91-92.

42. Floyd M. Clay, *A History of the Little Rock District, U.S. Army Corps of Engineers, 1881-1979* (Little Rock: U.S. Army

Engineer District, 1979), p. 5; Margaret Ross, "Six Steamboats . . . ," *Arkansas Gazette,* 13 Mar. 1966.

43. Trover and Swindler, *Arkansas,* p. 11.

44. Grant Foreman, *Marcy & the Gold Seekers; the Journal of Captain R.B. Marcy, with an Account of the Gold Rush Over the Southern Route* (Norman: University of Oklahoma Press, 1968); Amelia Martin, ed., "Fort Smith Hub from Which the Western Gold Seekers Went into the Wilderness by Frank Weaver," *Fort Smith Historical Society Journal* 2 (Sept. 1978):56-60.

45. The general history of both the United States' and the Confederate States' engineers between 1861 and 1865 is drawn from Phillip M. Thienel, "Engineers in the Union Army, 1861-1865," *Military Engineer* 42 (1955):36-41, 110-115, 410-420; William M. Robinson, Jr., "The Confederate Engineers," *Military Engineer* 22 (1930):297-305, 410-419, 512-517; George T. Ness, Jr., "Army Engineers of the Civil War," *Military Engineer* 57 (1965):38-40; Johnson, *Louisville District,* 103-115.

46. By midnight on 16 June 1775, the day the Continental Congress established the first American military engineering unit, Colonel Richard Gridley, the officer named Chief Engineer for the Continental Army, and his men were busy fortifying Breeds Hill near Boston. By dawn they had completed the earthwork fortification and Colonel Gridley and his men joined the line as the battle ensued. Colonel Gridley was wounded and carried from the field as a casualty of what became known as the Battle of Bunker Hill. The Corps' military mission continues to have this twofold nature. The general history of the Corps of Engineers' military mission activities presented in this chapter is drawn from Abbot, "Corps of Engineers," pp. 413-426; Edward Burr, *Historical Sketch of the Corps of Engineers, U.S. Army,* Occasional Papers: The Engineer School No. 71 (1939) ; C.H. Chorpening, "Waterway Growth in the United States," *Transactions of the American Society of Civil Engineers* (1952):985-1010; Walter P. Craighill, "Corps of Engineers, United States Army," *Transactions of the American Society of Civil Engineers* 8 (1897):429-435; Lenore Fine and Jessie A. Remington, *The Corps of Engineers: Construction in the United States,* United States Army in World War II (Washington, DC: Office of the Chief of Military History, U.S. Army, 1972); A.A. Humphreys, "Historical Sketch of the Corps of Engineers," in U.S. Congress, House, *Reorganization of the Army,* 45th Cong., 3d sess., H.R. 555, pp. 327-349; Henry C. Jewett, "History of the Corps of Engineers to 1915," *Military Engineer* 38 (1946):340-346; and Ellis L. Armstrong et al., eds., *History of Public Works in the United States 1776-1976* (Chicago: American Public Works Association, 1976), pp. 585-643.

47. Michael B. Dougan, *Confederate Arkansas: The People and Policies of a Frontier State in Wartime* (Fayetteville: University of Arkansas Press, 1976), p. 68. For an overview of civil war activity in what became the Little Rock District see Thomas A. Belser, Jr., "Military Operations in Missouri and Arkansas, 1861-1865" (Ph.D. diss., Vanderbilt University, 1958).

48. Maurice Matloff, ed., *American Military History,* 2d ed. (Washington, DC: Office of the Chief of Military History, United States Army, 1973), p. 233; *The Battle of Pea Ridge, 1862: Published in Commemoration of the 100th Anniversary of the Battle of Pea Ridge and the Dedication of the Pea Ridge National Military Park to be held May 31, 1963* (Rogers, AR: Pea Ridge National Military Park Centennial Committee, 1962); "Confederate Troops at the Battle of Pea Ridge," *Washington County Flashback* 2 (Mar. 1952):9; "Federal Troops at the Battle of Pea Ridge," *Washington County Flashback* 2 (Mar. 1952):10; Claire N. Moody, *Battle of Pea Ridge; Or Elkhorn Tavern* (Little Rock: Arkansas Valley Print Co., 1956). See also the numerous biographies of General Robert E. Sterling Price which are available.

49. Robinson, "Confederate Engineers," p. 411.

50. Dougan, *Confederate Arkansas,* p. 87.

51. Ludwell H. Johnson, *Red River Campaign: Politics and Cotton in the Civil War* (Baltimore: Johns Hopkins Press, 1958), pp. 172-176; James H. Atkinson, *Forty Days of Disaster: The Story of General Frederick Steele's Expedition into Southern Arkansas, March 23 to May 3, 1864* (Little Rock: Pulaski County Historical Society, n.d., Bulletin No. 1).

52. Johnson, *Red River Campaign,* p. 260.

53. The organization and administrative history of the Corps of Engineers presented throughout this section of this chapter is drawn on Burr, *Historical Sketch of the Corps of Engineers;* Chorpening, "Waterway Growth," pp. 985-1010; Craighill, "Corps of Engineers," pp. 429-435; Fine and Remington, *Corps of Engineers*; Hill, *Roads, Rails and Waterways;* Beers, "History of the U.S. Topographical Engineers," pp. 287-291, 348-352; Robinson, "Corps of Topographical Engineers," pp. 303-307; Abbot, "Corps of Engineers," pp. 413-426; Holt, *Office of the Chief of Engineers;* Humphreys, "Historical Sketch of the Corps of Engineers," pp. 327-349; Jewett, "History of the Corps of Engineers," pp. 340-346; Johnson, *Louisville District,* pp. 6, 15-19, 43-46, 103-120; Arthur Maass, *Muddy Waters: The Army Engineers and the Nation's Rivers* (Cambridge, MA: Harvard University Press, 1951); Merritt, *St. Paul District,* pp. 38-57; Morgan, *Dams and Other Disasters;* I.Y. Schermerhorn, "The Rise and Fall of River Improvement in the United States," *Journal of the Franklin Institute* 89 (Apr. 1895):264-276; Major General Harry Taylor, "Civil Works of the Corps of Engineers," *Military Engineer* 17 (Mar.-Apr. 1925):95-104; Gilbert A. Youngberg, "The Civil Works Activities of the Corps of Engineers," *Military Engineer* 13 (1921):73-77.

54. Edward L. Pross, "A History of Rivers and Harbors Appropriation Bills, 1866-1933" (Ph.D. diss., Ohio State University, 1938), pp. 43-89; E.H. Ruffner, *The Practice of the Improvement of the Non-Tidal Waters of the United States* (New York: J. Wiley & Sons, 1886), p. 5; Chorpening, "Waterway Growth," p. 1001; Schermerhorn, "River Improvement," pp. 264-276.

55. *Rivers and Harbors Laws,* vol. I, pp. 151-165.

56. Pross, "Appropriation Bills," p. 42; Martin Reuss, *Army Engineers in Memphis District* (Memphis: U.S. Army Engineers District, 1982), p. xiv.

57. Merritt, *St. Paul District,* pp. 45-46.

58. Pross, "Appropriation Bills," p. 43-44; Reuss, *Memphis,* p. xiv.

59. *Register of the Graduates and Former Cadets, U.S. Military Academy* (West Point, NY: Association of Graduates, 1980), Entry 1970; Reuss, p. xiv.

60. John G. Parke to W.F. Reynolds, 15 Mar. 1871, Series 66, RG 77, NA, Washington, DC (collection hereafter cited as Series 66, RG 77); Parke to J.H. Simpson, 19 Mar. 1873, Series 66, RG 77; Humphreys to Suter, 1 July 1874, Series 66, RG 77; Humphreys to W.W. Belknap, 4 Aug. 1870, Series 23, RG 77, NA, Washington, DC (collection hereafter cited as Series 23, RG 77); H.G. Wright to Thomas M. Guntia, 19 Apr. 1880, Series 66, RG 77.

61. U.S. Army, Corps of Engineers, *Annual Report of the Chief of Engineers United States Army, to the Secretary of War for the Year 1867* (Washington, DC: Government Printing Office, 1868), pp. 376-395. The annual reports of the Chief of Engineers

are among the most important sources of the history of the Corps of Engineers. Before 1867 the annual report of the Chief of Engineers was printed in various government documents, usually accompanying the President's annual message to Congress. Beginning in 1867 the *Annual Report of the Chief of Engineers* was separately printed and bound and the series has continued to be issued every year since then. Published at the end of each fiscal year—currently there is a time lag of eighteen to twenty-four months—the exact title and format of the series have varied slightly from time to time. Hereafter all reports from this series will be cited as *Annual Report* followed by the fiscal year that the report covers (*Annual Report, 1868,* pp. 590-591; *Annual Report, 1869,* pp. 291-294; Johnson, *Louisville District,* pp. 115-116).

62. *Annual Reports, 1867-1874.*

63. Johnson, *Louisville District,* p. 158. For example, the wooden-hulled snag boat *Wichita* was built in Little Rock in 1882. In 1887 its hull was so damaged by a snag that a new hull was needed, at an estimated cost of $10,000. By 1890 Captain Taber, then officer in charge, estimated he needed $20,000 annually to run, care for, and repair the *Wichita* [Floyd M. Clay, "Notes Towards a History of the Little Rock District," copy in Box 209, Little Rock (hereafter cited as Clay, "Notes"); Henry S. Taber to Chief of Engineers Maloney, 27 Oct. 1890, File 5902, Box 37, Series 96, RG 77, NA, Washington, DC (collection hereafter cited as Series 96, RG 77); *Annual Report, 1874,* pp. 63, 370; Reuss, *Memphis,* p. xiv].

64. Although Colonel William E. Merrill has been credited with introducing this innovation to the Corps of Engineers (see, for example, Johnson, *Louisville District,* p. 158), Merrill's *E.A. Woodruff* was not built first. Both men proposed the idea in 1874, but Suter got the job done quicker. *Annual Report, 1874,* pp. 63, 370, 404-405.

65. Hunter, *Steamboats,* pp. 115-116; Theodore Allen, "Iron Hulls for Western River Steamboats," *Transactions of American Society of Civil Engineers* 2 (1873):271-287.

66. *Annual Report, 1874,* pp. 63, 370.

67. Morgan, *Dams and Other Disasters,* p. 260.

68. *Register of Graduates,* Entry 2000.

69. *Annual Report, 1881,* pp. 214-215.

70. Hunter, *Steamboats,* pp. 115-116; Allen, "Iron Hulls," pp. 271-287; Johnson, *Louisville District,* p. 158.

71. *Annual Report, 1881,* p. 1429.

72. Ibid., pp. 214-215.

73. Trover and Swindler, *Arkansas,* p. 19.

74. U.S. Army Engineer District, Tulsa, "Historical Data on Arkansas River."

75. Trover and Swindler, *Arkansas,* pp. 19-20.

76. Hunter, *Steamboats,* pp. 566-584.

77. There are many fine studies of the postwar readjustment. This account draws heavily on J.G. Randall and David Donald, *The Civil War and Reconstruction* (Boston: D.C. Heath & Co., 1961); Kenneth M. Stampp, *The Era of Reconstruction 1865-1877* (New York: Vintage Books, 1967); John Hope Franklin, *Reconstruction: After the Civil War* (Chicago: University of Chicago Press, 1962); and E.M. Coulter, *The South During Reconstruction* (Baton Rouge: Louisiana State University Press, 1947). A good account of southern agriculture during reconstruction is provided by F.A. Shannon, *The Farmer's Last Frontier: Agriculture, 1860-1897* (New York: Farrar & Rinehart, 1945).

78. Trover and Swindler, *Arkansas,* pp. 19, 21.

79. The best account of this episode in American history is provided by C. Vann Woodward, *Reunion and Reaction* (New York: Doubleday, 1956).

80. Clay, *Little Rock District,* p. 5.

81. *Annual Report, 1881,* p. 1429.

82. John G. Parke to N.H. Van Vorhes, 17 Jan. 1879; Parke to W.B. Ryan, 1 Feb. 1879; Parke to Secretary of War, 13 Feb. 1879; and H.G. Wright to W.F. Slemons, 6 June 1879, all in Series 66, RG 77.

83. *Annual Report, 1881,* pp. 214, 1502-1508.

84. *Annual Report, 1884,* p. 1395.

85. *Annual Report, 1893,* p. 2107.

86. *Annual Report, 1880,* p. 1368.

87. *Annual Report, 1879,* pp. 1028-1029; Dobney, *St. Louis District,* pp. 52-53.

88. See Note 87 above.

89. *Annual Report, 1881,* pp. 214, 1502-1508.

90. *Annual Report, 1879,* pp. 1028-1029; Dobney, *St. Louis District,* pp. 52-53.

91. *Annual Report, 1881,* pp. 1504-1508.

92. Ibid., pp. 1502-1504.

Notes

Chapter III

1. *U.S. Statutes at Large,* vol. 21, pp. 37-38; Holt, *Office of the Chief of Engineers,* pp. 74-75.

2. *Annual Report, 1881,* pp. 354-355. Suter was one of the seven members of the Commission for fifteen years, from 1880 until 1895. See also *Annual Reports, 1880-1895.*

3. For a brief biography of Captain Handbury, see Appendix I.

4. From 1866 until 1898 Congress authorized the Corps of Engineers to include a maximum of 109 officers under the command of the Chief of Engineers *(Annual Reports, 1866-1898).* During Handbury's tenure as officer in charge of the collection of projects that were later designated the Little Rock District, Major General H.G. Wright was Chief of Engineers. When Handbury assumed these duties Robert Todd Lincoln was Secretary of War under President James A. Garfield.

5. *Annual Report, 1881,* pp. 213-219, 1429-1508.

6. Ibid., p. 219.

7. Although many individual histories of Corps of Engineers Districts and Divisions have been written in the last fifteen years, no detailed history of the relationship between Districts' progenitors, Districts, Divisions, and the Office of the Chief of Engineers has been published. This topic offers excellent opportunities for future scholarly research. Raymond Merritt noted the problem in his history of the St. Paul District published in 1980 and attempted to clarify some of this aspect of the Corps of Engineers administrative history (Merritt, *St. Paul District,* pp. 38-42, 52-57). Dr. Merritt's study involved an examination of organizational breakdown and terminology used in the annual reports that he consulted in relation to his study of the St. Paul District. He then drew conclusions as to the administrative structure based on his interpretation of the information contained in the annual reports (telephone interview, David W. Vannoy with Raymond H. Merritt, 8 Nov. 1985; interview notes submitted to the Little Rock District, 1987). Although in some cases, based on my reading of these same annual reports, I could not concur with Merritt's interpretations, I have built upon his account in developing my interpretation of the relationship between Districts' progenitors, Districts, Divisions, and the Office of Chief of Engineers. Dr. Merritt implies in his history that Districts were created in 1893 when they were officially called Districts in the annual reports (*St. Paul District,* p. 56). Although placing the date of origin earlier, in 1888, Johnson, in his history of the Louisville District, agrees that districts did not exist in 1881 (*Louisville District,* p. 4). There are other interpretations of these events. For example, Dobney's history of the St. Louis District says that Districts as distinct entities were created in 1873 (*St. Louis District,* pp. 44-45).

8. *Annual Report, 1893,* p. 272.

9. Ibid., p. 57; *Annual Report, 1915,* pp. 3-4. Merritt gives the date as 1890 for defining the Districts in terms of geographic area (*St. Paul District,* p. 56).

10. "Thomas Henry Handbury," in United States Military Academy, Association of Graduates, *Annual Report* (12 June 1917):30-37; *Register of Graduates,* Entry 2057. Johnson says that "prior to 1888 individual Engineer Officers reported operations at projects in their charge directly to the Office of the Chief of Engineers" (*Louisville District,* p. 4). This was clearly not the case for the officers in charge of the collection of projects that were later designated the Little Rock District. The Office of Western River Improvements was between the two in the chain of command.

11. John G. Parke to Thomas H. Handbury, 10 Mar. 1881, p. 249, vol. I, Series 66, RG 77.

12. Merritt, *St. Paul District,* p. 47; Chorpening, "Waterway Growth," p. 1008; Holt, *Office of the Chief of Engineers,* pp. 39-40, 76-77; *U.S. Statutes at Large,* vol. 21, p. 197, and vol. 30, p. 1154.

13. Although our research has not uncovered legislation specifically altering this policy (virtually all 1985 Corps public information pieces emphasize this policy), it should be noted that Congress has, in fact, given the Corps limited responsibility for initiating or proposing projects whenever it has authorized the Corps to do any regional planning. This was as true in 1879 when Congress established the Mississippi River Commission charged with comprehensive planning for the Mississippi River basin as in 1965 when it created seven commissions charged with long-range comprehensive planning for a national water resource development program.

14. The first section of each of these acts authorized the Corps to conduct preliminary examinations and surveys at designated locations.

15. The political history of the Gilded Age has been covered in lively and controversial fashion by Matthew Josephson in *The Politicos: 1865-1896* (New York: Harcourt Brace & Co., 1938) and by Ray Ginger in *Age of Excess* (New York: Macmillan Co., 1965). H.W. Morgan's *From Hayes to McKinley* (Syracuse, NY:

Syracuse University Press, 1969) offers a more solid and sympathetic treatment. J.A. Garraty's *The New Commonwealth* (New York: Harper & Row, 1968) and R.D. Marcus' *Grand Old Party: Political Structure in the Gilded Age* (New York: Oxford University Press, 1971) try to trace the changing character of the political system after 1877. The issue of the performance of the federal bureaucracy in the period is covered in J.G. Sproat's *"The Best Man": Liberal Reformers in the Gilded Age* (New York: Oxford University Press, 1968), Ari Hoogenboom's *Outlawing the Spoils* (Urbana: University of Illinois Press, 1961), and in several essays edited by H.W. Morgan in *The Gilded Age* (Syracuse, NY: Syracuse University Press, 1970).

16. *Annual Report, 1881,* p. 344. In 1881 the staff of the Office of the Chief of Engineers was organized in five divisions. The first division was responsible for functions related to the Corps' combat mission: fortifications and surveys relating thereto, armaments of fortifications, sites for engineer defenses, and the Board of Engineers for Defenses. The second division was responsible for administrative and professional functions such as the Battalion of Engineers, Engineer School of Application and Engineer Depot and Post, professional papers and information, personnel, orders, military reservations, and land files. The third division was responsible for functions related to the Corps' civil works mission including rivers and harbors improvements. The fourth division was responsible for fiscal functions such as accounts for disbursements, contracts, returns of Engineer property and instruments, applications for remittances, appropriations and estimates, and blank forms. The fifth division was responsible for functions related to the Corps' topographical mission: survey of lakes, explorations and surveys, reconnaissances, maps, instruments, and claims.

17. Merritt, *St. Paul District,* p. 52.

18. *Annual Report, 1881,* pp. 213-219, 1429-1508.

19. Johnson, *Louisville District,* pp. 91, 118.

20. For example, correspondence between Captain H.S. Taber, District Engineer, and Brigadier General T.L. Casey, Chief of Engineers, from January to November 1893 shows that Taber requested medicine almost weekly, citing as a big problem poor health among snag-boat crew members. According to Taber, this medicine was to be used "for preserving the health of improvement party on 'Improving Arkansas River, Arkansas,' employed in an unhealthy locality, remote from medical attendance." The types of medication that he requested included quinine, chill tonic, colic cure, salts, liniment, and sulfur powder, further indicating that the snag-boat crews were plagued with a number of ills [H.S. Taber to T.L. Casey, 26 Jan. 1893; Taber to Casey, 21 Mar. 1893; and Taber to Casey, 26 Sept. 1893, all in Series 98, RG 77, NA, Washington, DC (collection hereafter cited as Series 98, RG 77)].

21. U.S. Congress, Senate, *Message from the President of the United States to the Two Houses of Congress,* S.D. 1, 28th Cong., 2d sess., 1844, pp. 274-279.

22. Henry S. Taber to Chief of Engineers Malony, 27 Oct. 1890, file 5902, Box 37, Series 98, RG 77.

23. Henry M. Shreve as quoted in Dobney, *St. Louis District,* p. 21.

24. Interview, Floyd M. Clay with Harmond Black, 12 July 1967, transcript located in Box 209, Little Rock District (hereafter cited as Black interview).

25. Ibid.; *Annual Reports, 1881-1883; Arkansas Gazette,* 4 Aug. 1935. The number of boats is drawn from the annual reports while the number of crewmen is an estimate based on Captain Stephen H. Long's 1841 report that an individual snag-boat crew usually numbered twenty persons in all, but it could be increased to twenty-five or thirty. Harmond Black in 1967 reported (Black interview) that snag-boat crews numbered about thirteen by 1925 when he began working on them; the *Arkansas Gazette* reported in 1935 that snag-boat crews varied from twelve to twenty-nine at that time.

26. "Renaissance of a River," p. 4; *Annual Report, 1881,* p. 214.

27. Snagging was briefly discontinued in 1943 when the Corps suspended all maintenance activities for the duration of World War II. However, the District continued to hire contractors to conduct Arkansas River snagging operations as late as 1969 [U.S. Army, Corps of Engineers, Southwestern Division, *Water Resource Development in Arkansas 1967 (Dallas: U.S. Army Engineer Division, 1967),* p. 57; "Snagging Operations 1969," unpublished report, Box 077-77-0040, RG 77,Federal Archives and Record Center, Kansas City, MO (collection hereafter cited as RG 77, Kansas City)].

28. In 1832 Captain Richard Delafield estimated that it cost only $1.00 to remove fifteen trees on the bank to prevent snags, while it cost $8.00 to remove each snag. In 1835 Lieutenant Alexander H. Bowman estimated that it cost only $1.00 per tree to remove trees on the bank, while it cost $13 to remove each snag (U.S. Congress, House, *Message on Improvement of the Navigation of the Ohio and Mississippi Rivers,* H.D. 22-26, 22d Cong., 2d sess., 1833; *Annual Report, 1835,* p. 178).

29. U.S. Congress, House, H.D. 20-11, 20th Cong., 1st sess., 1827, p. 4.

30. In 1873 Major Suter suggested carrying Shreve's idea along the Arkansas a step further. He recommended preventing snags by preventing the banks from caving in. He urged consideration of the construction of bank protection devices along the Arkansas River. Such a program was, however, too vast and too expensive to implement at that time ("Work by the Corps of Engineers on the Arkansas River up to the Year 1907," unpublished manuscript summarized in Clay, "Notes").

31. One of the more interesting approaches to preventing snags being advocated in 1881 was that put forward by Major Oswald H. Ernst, officer in charge of the St. Louis Corps of Engineer office from 1880 to 1886. Ernst urged that trees be planted on the riverbanks, arguing that the tree roots would actually hold the banks together and slow erosion (Dobney, *St. Louis District,* p. 55).

32. *Annual Report, 1883,* p. 129.

33. Adjusted to the 1967 basis, what $28 would buy in 1883, it took $324.30 to buy in January 1986. Thus, $36,000 in 1883 had the purchasing power of $416,957 in January 1986 (U.S. Department of Commerce, Bureau of the Census, *Historical Statistics of the United States Colonial Times to 1970* [Washington, DC: U.S. Government Printing Office, 1975], p. 211; *Consumer Price Index,* Feb. 1986).

34. *Annual Report, 1884,* p. 228.

35. *Annual Report, 1896,* p. 244; *Annual Report, 1897,* p. 1952.

36. *Annual Report, 1881,* p. 1516.

37. John G. Parke to Thomas H. Handbury, 13 Apr. 1881, vol. 1881, p. 422, Series 66, RG 77.

38. Clay, "Notes."

39. *Annual Report, 1881,* p. 214; *Annual Report, 1882,* p. 211.

40. Bobby Joe Williams, *Into the Second Century: Memphis Engineers District, 1976-1981* (Memphis: U.S. Army Engineer District, 1983), p. 5.

41. *Annual Report, 1872,* pp. 420-425.

42. *Annual Report, 1881,* pp. 1481-1499.

43. U.S. Congress, House, *Letter from Secretary of War Transmitting Report of the Chief of Engineers upon the Improvements of Certain Rivers and Harbors,* H.D. 60, 41st Cong., 2d sess., 1870, pp. 80-85.

44. *Annual Report, 1875,* p. 67.

45. *Annual Report, 1883,* p. 1165.

46. Ibid.

47. Ibid.; see note 36 above. The *Annual Report, 1887* (as cited in Clay, "Notes") reports cotton costing $50 per bale.

48. *Annual Report, 1883,* p. 1165.

49. *Annual Report, 1881,* pp. 1477-1480.

50. Ibid., pp. 1467-1477.

51. *Annual Report, 1882,* p. 1587; *Annual Report, 1887,* as cited in Clay, "Notes."

52. *Annual Report, 1884,* p. 1401; *Annual Report, 1885,* p. 1558.

53. *Annual Report, 1885,* p. 1558; *Annual Report, 1887,* as cited in Clay, "Notes"; Bureau of the Census, *Historical Statistics,* p. 211; *Consumer Price Index Information.* The volume of 1885 cotton commerce Taber estimates is much greater than that in 1887. Jon. D. Adams, president of the Memphis, Vicksburg and Arkansas City Packet Company, estimates 70,000 bales as an annual average of cotton carried out by steamboats from Little Rock to the Mississippi (*Annual Report, 1887,* as cited in Clay, "Notes"). It is likely that this is a more accurate average and that 1885, the year Taber cites, had a particularly high volume of cotton haulage due to a good harvest or some other natural factor. Certainly the 1887 production year for all agricultural ventures was poor due to the dry summer of 1886 and the bitter winter of 1886-1887.

54. *Annual Report, 1881,* p. 1500; *Annual Report, 1885,* p. 1558.

55. *Annual Reports, 1881-1884.*

56. *Annual Report, 1884,* p. 1401.

57. Handbury, 1881 and 1882, as cited in Clay, "Notes."

58. *Annual Report, 1884,* p. 1393-1395.

59. *Annual Report, 1883,* p. 220.

60. *Annual Report, 1881,* pp. 216-217, 1429-1431; *Annual Report, 1882,* pp. 211-217.

61. *Annual Report, 1883,* p. 1170.

62. *Annual Report, 1881,* pp. 218-219, 1436-1466; *Annual Report, 1882,* p. 215.

63. *Annual Report, 1883,* p. 223.

64. *Annual Report, 1882,* p. 217.

65. *Annual Report, 1884,* p. 1396.

66. Ibid.

67. Ibid.

68. Ibid., p. 1394

69. *Annual Report, 1885,* p. 1564-1601.

70. J.C. Merrill to Attorney General of the United States, 4 Dec. 1884; and OCE to Secretary of State, 30 Dec. 1884, both in vol. 3 of *1884,* p. 1838, Series 66, RG 77.

71. *Annual Report, 1887,* p. 1511.

72. This administrative change was the result of a Corps-wide reorganization (see note 6 above). The local populous' perception of what the District and/or a specific District Engineer could do for them and the role the District could play in the region as well as the change in these perceptions over the years is well reflected in a series of letters and newspaper clippings related to an 1893 controversy about how well Taber was meeting the expectations he had created (File 4406, Box 65; and File 2997, Box 47, both in Series 98, RG 77).

73. Local citizens' complaints about Taber's style abound. See, for example, File 4406, Box 65; and File 5286, Box 78, both in Series 98, RG 77.

74. *Annual Report, 1887,* pp. 1527-1548.

75. *Annual Report, 1885,* p. 1558.

76. Ibid.

77. *Annual Report, 1888,* p. 1414.

78. *Annual Report, 1887,* p. 1514.

79. *Annual Report, 1885,* p. 250.

80. *Annual Report, 1887,* p. 1508.

81. Clay, "Notes."

82. For open-range cattle ranching on the plains see Lewis Atherton, *The Cattle Kings* (Bloomington: Indiana University Press, 1961); E.S. Osgood, *The Day of the Cattlemen* (Minneapolis: University of Minnesota Press, 1929); Louis Pelzer, *The Cattlemen's Frontier* (Glendale, CA: Arthur H. Clark Co., 1936); and W.p. Webb, *The Great Plains* (Boston: Houghton & Mifflin, 1931). For farmers' problems see Shannon, *Farmer's Last Frontier;* S.J. Buck, *The Granger Movement* (Cambridge, MA: Harvard University Press, 1913); J.D. Hicks, *The Populist Revolt* (Minneapolis: University of Minnesota Press, 1931); Richard Hofstadter, *The Age of Reform* (New York: Vintage Books, 1955); Norman Pollack, *The Populist Response to Industrial America* (Cambridge, MA: Harvard University Press, 1962); and W.T.K. Nugent, *The Tolerant Populists* (Chicago: University of Chicago Press, 1963). On the depression of the 1890s see Rendigs Fels, *American Business Cycles* (Westport, CT: Greenwood Press, 1973).

83. *Annual Report, 1891,* pp. 2049-2050; *Annual Report, 1892,* p. 1684; *Baxter County Citizen,* 29 Nov. 1893 (Enclosure 3, File 4406, Box 65, Series 98, RG 77).

84. For expressions of Arkansas River valley residents' views and dissatisfaction with Captain Taber, see *Arkansas Democrat,* 6 and 11 Nov. 1893 (Enclosures 1 and 2, File 4406, Box 65, Series 98, RG 77) and Petition of Citizens of Dardenelle, AR (1 Feb. 1894, File 5286, Box 78, Series 98, RG 77). For Batesville residents' points of view, see *Baxter County Citizen,* 29 Nov. 1893 (Enclosure 3, File 4406, Box 65, Series 98, RG 77). As Taber pointed out to Chief Engineer Casey (Captain H.S. Taber to Brigadier General T.L. Casey, 4 Dec. 1893, File 4406, Box 65, Series 98, RG 77), once the representative of the Arkansas River valley had gotten the new appropriation designed for both areas, he could not exacerbate the situation by ignoring the demands of their constituents entirely. Taber was, despite what he might have indicated to the local citizens, a servant of Congress and both he and the Chief Engineer knew this fact well.

85. Captain H.S. Taber to Brigadier General T.L. Casey, 7 Dec. 1893; Brigadier General T.L. Casey to Secretary of War Daniel S. Lamont, 11 Dec. 1893; Captain H.S. Taber to Brigadier General T.L. Casey, 21 Dec. 1893; and Captain John Knight to Captain H.S. Taber, 27 Mar. 1894, all in File 2997, Box 47, Series 98, RG 77.

86. Petition of citizens of Dardanelle, AR, to W.L. Terry, Representative, 4th Arkansas District, 1 Feb. 1894; Captain C.F. Palfrey to Brigadier General T.L. Casey, 23 Mar. 1894; and Captain C.F. Palfrey to W.L. Terry, 28 Mar. 1893, all in File 5286, Box 78, Series 98, RG 77. The details of Palfrey's appointment may be found in Brigadier General T.L. Casey to Daniel S. Lamont, 11 Dec. 1893, File 925, Box 11, Series 98, RG 77 and Major M.B. Adams to Captain C.F. Palfrey, 18 Dec. 1893, File 4651, Box 68, Series 98, RG 77. Palfrey's stand on the White River locks is reported in "Miscellaneous C," Clay "Notes."

87. For fuller biographies of both Captain Taber and Lieutenant Sibert, see Appendix I.

Similarly, in 1888 accumulated garbage and debris hindered navigation in New York Harbor. The famous big-city political boss Richard Croker came into control of New York's Tammany Hall organization in the mid-1880s. His political machine was instrumental in getting Congress to authorize the Corps of Engineers to regulate the disposal of refuse everywhere in the country as part of the Corps' national effort to improve navigation [*U.S. Statutes at Large,* vol. 25, p. 209; Merritt, *St. Paul District,* p. 46; Chorpening, "Waterway Growth," p. 1007; Holt, *Office of Chief of Engineers,* pp. 40-41, 77; Albert E. Cowdrey, *The Delta Engineers: A History of the U.S. Army Corps of Engineers in the New Orleans District* (New Orleans: U.S. Army Engineer District, 1971), pp. 332-343]. At first the Corps used this new continuing authority only in New York City. Later as new needs arose the Corps used the authority in other regions of the country. By 1893, building upon the work of the New York machine, the California congressional delegation got the definition of debris enlarged to include mining wastes. This law, like the Mississippi River Commission enabling act, also further recognized the nation's concern with and responsibility for flood control *(U.S. Statutes at Large,* vol. 27, p. 507; Merritt, *St. Paul District,* p. 46; Chorpening, "Waterway Growth," p. 1008; Holt, *Office of Chief of Engineers,* pp. 37-38, 76-79; Armstrong et al., eds., *History of Public Works,* p. 249). The Rivers and Harbors Act of 1888 also expanded the congressional definition of what kinds of work fell under the heading of improvements to navigation by making the Corps of Engineers responsible for regulation of the construction of bridges crossing navigable waterways (*U.S. Statutes at Large,* vol. 23, p. 148). Building on this beginning, Congress passed a series of laws giving the Corps continuing authority to regulate roads, pipes, and wires crossing navigable waters. By act of Congress the navigable waters of the United States are those subject to the ebb and flow of the tides and/or those that are presently, have in the past, or may in the future be used in the transportation of interstate or foreign commerce. Lands below the elevation of ordinary high water—that is, the flood plain—adjacent to streams and lakes are also now defined by Congress as part of the waters of the United States subject to Corps authority. Seen in isolation, these political responses to clearly local needs have been characterized as selfish and self-serving; however, as in the cases of the problems arising in the alluvial valley of the Mississippi River and those in New York and California, frequently these specific local problems indicated the kinds of problems that later emerged in the rest of the country when municipal and industrial development occurred. Building upon extensions of the Corps' general continuing authorities granted in response to specific local needs, the political process led Congress to enact seminal legislation redefining the role of the Corps in ways that have had a significant impact on not only urbanization but also industrial development and the quality of life throughout the United States.

For a comparison of this series of Rivers and Harbors Acts, and a review of standard flood control verbiage, see the Rivers and Harbors Acts of 1879 to 1897 in the *Statutes at Large,* vols. 21-28.

94. Elmo Ingenthron, *The Land of Taney: A History of an Ozark Commonwealth* (Ozark, MO: The Ozark Mountaineer, 1974), p. 65.

88. *Annual Report, 1895,* p. 1922.

89. *Annual Report, 1896,* p. 294. In an 1888 General Order, Brigadier General T.L. Casey, Chief Engineer from 1888 to 1895, appointed five Division Engineers to supervise the work of officers in charge within his rivers and harbors division [telephone interview, author with Janet McDonnell (Historian, Office of History, OCE), 20 May 1987]. Colonel C.B. Comstock was given command of the newly created Southwestern Division headquartered in St. Louis. Each Division Engineer supervised the work of a specific group of officers in charge. The Southwestern Division Engineers supervised Captain Taber (U.S. Congress, House, *Report of the Secretary of War; Being Part of the Message and Documents Communicated to the Two Houses of Congress, Volume 1, Part I, Annual Report of the Chief of Engineers, 1889,* H.D. 1, Part 2, 51st Cong., 1st sess., 1889, p. 16). This administrative change meant little to Taber who, like his predecessors, had been reporting to the Corps of Engineers office in St. Louis since assuming command five years before. The administration's change simply changed the title of the office to which he reported. The captain no longer reported to a major in St. Louis, but to a colonel. The change was already made when Lieutenant Siebert assumed command (see note 6 above).

90. Roald Tweet, *A History of the Rock Island District, U.S. Army Corps of Engineers, 1866-1983,* (Rock Island, IL: U.S. Army Engineer District, 1984), pp. 147-195; Mary Yeater, "Hennepin Canal," Historical District, National Register of Historical Places Inventory—Nomination Form, Illinois Department of Conservation, 29 July 1977; Mary Yeater, "Hennepin Canal" (four parts), *American Canals* Nos. 19-22 (Nov. 1976-Aug. 1977).

91. Boyle interview; interview, Floyd M. Clay with B.M. Huddleston, 12 July 1967, transcript located in Box 209, Little Rock District (hereafter cited as Huddleston interview).

92. This fact is still resented and misunderstood by many local residents. See, for example, Clay's *Little Rock District,* p. 13, concerning John P. Morrow, Sr.'s opinions (Mr. Morrow of Batesville was known as the "Father of the White River Projects," referring to the post-1930 high-dam projects), and Floyd M. Clay's interview with John P. Morrow, Jr., 11 July 1967, transcript located in Box 209, Little Rock District (hereafter cited as Morrow interview).

93. Once the constitutional questions about whether the federal government should finance the improvement of the waterways of a region as a benefit to navigation had been settled, the political process inevitably led to the expansion of the definition of what kinds of work fell under the heading of improvements for navigational purposes. Sometimes, when local water-related problems arose within a specific congressional district; local citizens and their representatives saw the problem as susceptible to improvement using the technology, skills, and personnel already in place in their area in their Corps of Engineers District, despite the fact that the problem did not fall under the already existing congressional definition of navigational hazards on which the Corps of Engineers was already authorized to work. If the political representatives of the area had enough clout or enough skill in political maneuvering, the continuing authority of the overall Corps could be, and was, altered by congressional action that allowed the Corps to tackle the problem. For example, the 1879 Mississippi River Commission was, in part, a response to the local public demand for improving navigation and flood control. It put the federal government halfway into the flood control business under the pretense that all the work was being done to benefit navigation (*U.S. Statutes at Large,* vol. 21, pp. 37-38).

Notes

Chapter IV

1. *Annual Reports, 1898-1901.* From 1898 until 1901 Congress authorized the Corps of Engineers to include a maximum of 127 officers under the command of the Chief Engineer. The distribution of these officers among internal Corps divisions was at the Chief's discretion.

2. *Arkansas Gazette,* 7-13 May 1898.

3. The most prominent author presenting this thesis is Samuel P. Hays in his *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (Cambridge, MA: Harvard University Press, 1959; reprinted with a new preface by the author, New York: Antheneum, 1974). Although there are many similarities between arguments presented in this chapter and specific arguments used in Hays' study, most of the points presented here were developed independently of Hays' work. This discussion is presented here because Hays' book was not consulted until very late in the research for this book.

4. *U.S. Statutes at Large,* vol. 30, p. 1154.

5. See Chapter III, note 93, above.

6. Neil J. Barker, "Sections 9 and 10 of the Rivers and Harbors Act of 1899: Potent Tools for Environmental Protection," *Ecology Law Quarterly* 6, No. 1 (1976):109-159; Don M. Casto III, "The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment," *Natural Resources Journal* 11 (Jan. 1971):1-47.

7. *U.S. Statutes at Large,* vol. 30, p. 1154; *Annual Report, 1900,* p. 425.

8. *Annual Report, 1900,* p. 2581.

9. *Annual Reports, 1893-1899.*

10. *Annual Report, 1900,* p. 2581.

11. Ibid., p. 2596.

12. *Annual Report, 1902,* p. 4. Congress increased the maximum number of officers the Corps was authorized to include from 127 to 160 (*Annual Report, 1902,* p. 4).

13. *Annual Report, 1903,* pp. 3-5; Merritt, *St. Paul District,* p. 54.

14. See note 13 above.

15. In 1904 Congress increased the maximum number of officers the Corps was authorized to include from 160 to 188 (*Annual Report, 1905,* p. 3; *Annual Report, 1909,* p. 6).

16. *Arkansas Gazette,* 11 April 1913. Randolph's real reason for arguing that civil works be taken away from the Corps was probably more complex. Randolph was a supporter of multiple-use water resource development, particularly the Great Lakes to Gulf of Mexico deep waterway. As with many advocates of this position, he apparently saw the Corps as a force keeping Congress from authorizing such projects. Randolph's call for discontinuation of the Corps' civil works mission echoed Joseph E. Randall's 1908 call for the same action and was perhaps similarly motivated. Samuel P. Hays asserts that Randall's call was a specific response to Corps opposition to multiple-use river improvement (Hays, *Conservation and Efficiency,* pp. 94-95). Randolph was also a civilian engineer, and his call also foreshadows similar 1920s calls by other representatives of the by then mature private civilian engineering industry. Randolph, like these later civilian engineers, wanted civilian engineers rather than military engineers doing the work.

17. In 1910 Congress increased the maximum number of officers the Corps was authorized to include from 188 to 248, but it decreed the increase be phased in over a five-year period. It was at this time that the Congress also authorized the Corps for the first time to recruit civilian engineers if not enough men could be obtained from West Point (*U.S. Statutes at Large, vol. 36,* p. 957).

18. Johnson, *Louisville District,* p. 170; Hays, *Conservation and Efficiency,* pp. 93-94.

19. Hays attributes these values to Progressive leaders of the early twentieth-century conservation movement (*Conservation and Efficiency,* p. 3). However, he clearly excludes the Corps from this movement and concludes that it shows none of the movement's ideas.

20. Histories of the U.S. Reclamation Service are surprisingly abundant. George Whaton James' *Reclaiming the Arid West: The Story of the United States Reclamation Service* (New York: Dodd, Mead, & Co., 1917) and the Institute for Government Research's *The U.S. Reclamation Service: Its History, Activities and Organization* (New York: D. Appleton & Co., 1919) are readily available in many general-circulation libraries. Alan R. Dickerman, George E. Radosevich, and Kenneth C. Nobe's *Foundation of Federal Reclamation Policies: An Historical Review of Changing Goals and Objectives* (Fort Collins: Department of Economics, Colorado State University, 1970) offers more modern treatments. Hays' *Conservation and Efficiency* deals extensively with the issue.

21. For example, the 280-foot-high Theodore Roosevelt Dam in Arizona was designed and constructed between 1903 and 1911 and provides 1.4 million acre-feet of water storage. In the same

period the Reclamation Service also built the 214-foot-high Pathfinder Dam on the Platte River and the 325-foot-high Shoshone Dam (now known as the Buffalo Bill Dam) in northern Wyoming.

22. Armstrong, *History of Public Works,* p. 31; Hays, Conservation and Efficiency, pp. 105-106.
23. Hays, *Conservation and Efficiency,* pp. 108-111.
24. *U.S. Statutes at Large,* vol. 35, p. 822.
25. See Chapter II, note 37, above.
26. Merritt, *St. Paul District,* pp. 68-93.
27. Armstrong, *History of Public Works,* pp. 348-350.
28. *U.S. Statutes at Large,* vol. 39, pp. 948-951.
29. Ibid., p. 54; and Chapter II, note 37, above. Prior to 1917 there were some few exceptions to this rule; that is, times when the Corps supported the construction of reservoirs. For example, in 1913 a Board of Corps Engineers unanimously approved a plan formulated by a private engineering team for upstream reservoirs as a flood control measure in the Miami Conservancy District (Morgan, *Dams and Other Disasters,* pp. 272-275).
30. *U.S. Statutes at Large,* vol. 39, p. 950.
31. *Annual Report, 1901,* p. 431.
32. *Annual Reports, 1902-1917.*
33. Clay, *Little Rock District,* p. 12.
34. *Annual Report, 1902,* p. 1582.
35. *Arkansas Gazette,* 28 Dec. 1903.
36. *Arkansas Gazette,* 13-21 Oct. 1904; *Annual Report, 1905,* p. 1565.
37. *Arkansas Gazette,* 9 Feb. 1905.
38. James W. Leslie, *Saracen's County: Some Southeast Arkansas History* (Little Rock: Rose Publishing Co., 1974), p. 22.
39. *Pine Bluff Daily Graphic,* 1 Dec. 1908.
40. Leslie, *Saracen's County,* p. 24.
41. *Pine Bluff Daily Graphic,* 1 Dec. 1908.
42. Ibid.
43. Leslie, *Saracen's County,* p. 26.
44. *Pine Bluff Daily Graphic,* 1 Dec. 1908.
45. Ibid.
46. Ibid.
47. Ibid., 2 Dec. 1908.
48. Ibid., 1 Dec. 1908.
49. Ibid., 3 Dec. 1908.
50. Ibid., 2 Dec. 1908.
51. Ibid., 3 Dec. 1908.
52. Ibid., 4 Dec. 1908; Leslie, *Saracen's County,* pp. 28-29.
53. *Pine Bluff Daily Graphic,* 3 Dec. 1908.
54. Ibid., 4 Dec. 1908.
55. Boyd Point Levee File, District Archeologist's files, Little Rock District.
56. Harry Lee Williams, "The Old Riverboat Days," *Arkansas Gazette,* 5 Mar. 1967.
57. *Arkansas Gazette,* 8 Mar. 1906.
58. *Arkansas Gazette,* 21-23 Jan. 1906.
59. For a brief biography of Major Fitch, see Appendix I.
60. *Annual Report, 1908,* 506.
61. *Annual Report, 1903,* p. 1407.
62. Ingenthron, *Land of Taney,* p. 66.
63. *Annual Report, 1903,* p. 380; *Annual Report, 1915,* p. 997.
64. *Annual Report, 1915,* p. 997.
65. *Annual Report, 1911,* p. 654.
66. *Arkansas Gazette,* 20 Mar.-30 Apr. 1912.
67. *Arkansas Gazette,* 23 Mar., 9 June, and 21 Dec. 1912, 24 and 26 May and 2 Sept. 1914, and 14 and 20 June 1915; D. Clayton Brown, *Western Tributaries of the Mississippi,* National Waterways Study Series, Navigation History NWS 83-7 (Washington, DC: U.S. Army Engineer Water Resource Support Center, Institute for Water Resources, 1983), p. 21; P.R. Van Frank to S.A. Proctor, 9 June 1915, Box 19F-J25, General Administrative Files, 1908-1928, RG 77, Federal Archives and Record Center, Fort Worth (collection hereafter cited as GAF, RG 77, Fort Worth); *Annual Reports, 1914-1917.*
68. Fine and Remington, *Corps of Engineers,* pp. 18-40.
69. Major E.J. Dent to Joe T. Robinson, 11 Oct. 1916; Dent to Wm.F. Kirby, 20 Mar. 1917; and W.M. Blade to Secretary of War, 27 July 1917, all in Box 18, GAF, RG 77, Fort Worth; "Dent Makes Adverse Report," *Batesville Record,* 29 Mar. 1917, Box 25F-OC32, GAF, RG 77, Fort Worth.
70. P.R. Van Frank to Mount Olive Stove Co., 27 Nov. 1917, Box 18, GAF, RG 77, Fort Worth.
71. *Arkansas Gazette,* 15 June 1929. SB 1505; and F.B. Wilby to Major General Lytle Brown, 1 Nov. 1929, both in Box 25F-OC32, GAF, RG 77, Fort Worth.
72. *U.S. Statutes at Large,* vol. 39, pp. 948-951.
73. *Annual Report, 1917,* pp. 3-4; *Annual Report, 1918,* p. 4.
74. Merritt, *St. Paul District,* p. 55.
75. *Annual Report, 1921,* p. 1195.
76. Fine and Remington, *Corps of Engineers,* pp. 25-90.

Notes

Chapter V

1. *U.S. Statutes at Large,* vol. 43, pp. 1186-1198. The Colorado River was excepted because the Reclamation Service was already studying it for multipurpose water resource development. Interestingly, its charge did not demand that the river be improved for navigation.

2. U.S. Congress, House, H.D. 308, 68th Cong, 1st sess., 1924-1925, pp. 1-7.

3. *U.S. Statutes at Large,* vol. 44, pp. 1010-1021.

4. *National Geographic Magazine,* 52 (Sept. 1927):243-289; *Arkansas Gazette,* 25 Jan. and 20 Apr. 1927.

5. *Arkansas Gazette,* 20 Apr. 1927; *National Geographic Magazine* 52 (Sept. 1927):243-289.

6. "Entire White River Swept Away by Disastrous Flood," *Newark Journal,* 21 Apr. 1927; *Arkansas Gazette,* 20 Apr. 1927; Memphis *Commercial Appeal,* 6 May 1927, as cited in Pete Daniel, *Deep'n As It Come: The 1927 Mississippi River Flood* (New York: Oxford University Press, 1977), p. 124.

7. *Arkansas Gazette,* 20 Apr. 1927; *National Geographic Magazine,* 52 (Sept. 1927):243-289; Floyd M. Clay, A Century on the Mississippi: *A History of the Memphis District of the U.S. Army Corps of Engineers, 1876-1976* (Memphis: U.S. Army Engineer District, 1976), pp. 88-90.

8. *Arkansas Gazette,* 8 Jan. 1929.

9. Reuss, *Memphis,* p. xxi.

10. Ibid.; Clay, *Little Rock District,* p. 20; Cowdrey, *Delta Engineers,* pp. 30-33; *Arkansas Gazette,* 20 Apr. 1927.

11. *U.S. Statutes at Large,* vol. 45, p. 534; Reuss, *Memphis,* p. xxii.

12. Armstrong, *History of Public Works,* p. 257.

13. U.S. Congress, House, H.D. 90, 70th Cong., 1st sess., 1927.

14. Ibid.

15. Ibid.

16. *U.S. Statutes at Large,* vol. 45, p. 537.

17. *Rivers and Harbors Laws,* vol. 1, p. 382.

18. *U.S. Statutes at Large,* vol. 39, p. 948.

19. Ibid., vol. 45, p. 535.

20. "Report on the Control of Floods of the Mississippi River by Means of Reservoirs," House Flood Control Committee Document 2, 70th Cong., 1st sess., p. 33, as cited in Reuss, *Memphis,* p. xxii.

21. *U.S. Statutes at Large,* vol. 45, p. 538.

22. Interview, Floyd M. Clay with Joseph Stiles, 12 July 1967, transcript located in Box 208, Little Rock District (hereafter cited as Stiles interview).

23. Ibid.

24. Ibid.; Black interview; interview, Floyd M. Clay with Delbert Schmand, 25 Aug. 1967, transcript located in Box 209, Little Rock District (hereafter cited as Schmand interview).

25. See note 24 above; interview, Floyd M. Clay with p.J. Condry, 13 July 1967, transcript located in Box 209, Little Rock District (hereafter cited as Condry interview); interview, Floyd M. Clay with Robert L. "Shorty" Baird, 5 July 1967, transcript located in Box 209, Little Rock District (hereafter cited as Baird interview).

26. Speech, William K. Finefield, Sept. 1967, as cited in Clay, "Notes."

27. *U.S. Statutes at Large,* vol. 34, p. 225.

28. Circular Letter, Major Dwight F. Jones to District and Division Engineers Within the Continental Limits of the United States, 3 Feb. 1928, p. 1, copy in Box 1 F.4B241, GAF, RG 77, Fort Worth.

29. U.S. Congress, House, H.D. 1071, 69th Cong., 1st sess., 1925.

30. Jones to District and Division Engineers, 3 Feb. 1928, p. 2.

31. See files 4B-241 to 4F-35 in Box 1 F. 4B241, GAF, RG 77, Fort Worth.

32. Morgan, *Dams and Other Disasters,* p. 81.

33. Herbert Hoover, "The Improvement of Our Mid-West Waterways," *Annals of the American Academy of Political and Social Science* 135 (1928):18.

34. Rathbun Associates, *Historical-Architectural and Engineering Study, Locks and Dams 11-22, Nine-Foot Navigation Project, Mississippi River* (Rock Island, IL: U.S. Army Engineer District, 1985), pp. II-21 to II-22.

35. Morgan, *Dams and Other Disasters,* p. 299.

36. Rathbun Associates, *Locks 11-22,* p. II-23.

37. Rebecca J. Otto, "Fort Peck Dam," Historical District, National Register of Historic Places Inventory—Nomination Form, U.S. Army Corps of Engineers District Office, Omaha, NE, Oct. 1984.

38. Franklin M. Reck, *The Romance of American Transportation,* rev. ed. (New York: Thomas Y. Crowell Co., 1962), pp. 232-241.

39. Reuss, *Memphis,* pp. xxii-xxiii.

40. *Arkansas Gazette,* 31 Mar. 1931.

41. Martin Reuss, "The Army Corps of Engineers and Flood Control Politics on the Lower Mississippi," *Louisiana History* 23 (Spring 1982):140-144.

42. "Report on Comprehensive River Basin Investigation," unpublished report, GAF, RG 77, Fort Worth (hereafter cited as "Report on Comprehensive River Basin Investigation"). In a draft version of his history of the Southwestern Division, D. Clayton Brown states that a 1932 report that began as a 308 report demonstrated the engineering feasibility of major improvements in the White River basin that would reduce flooding and provide water for rice cultivation. The report specifically recommended against hydroelectric power projects on the premise that no market existed for the potential power. Dr. Brown does not explain what methods for doing the improvements the Corps evaluated. He states that the version of the report he is citing was written by the Memphis District but forwarded by the Lower Mississippi Valley Division (D. Clayton Brown, draft manuscript, Southwestern Division History, copy in Manuscript file, Office of History, OCE).

43. *Arkansas Gazette,* 20 Feb. 1931, 31 Mar. 1932.

44. "'Report on Comprehensive River Basin Investigation."

45. Harold L. Ickes to Franklin D. Roosevelt, 20 May 1939, in Edgar B. Nixon, comp. and ed., *Franklin D. Roosevelt and Conservation, 1911-1945,* vol. 2 (Hyde Park, NY: General Services Administration, National Archives and Records Service, Franklin D. Roosevelt Library, 1957), p. 336. Ickes was constantly trying to enlarge the Reclamation Service's sphere of authority. When in 1938 his efforts to get the Corps civil works responsibilities transferred to the Bureau of Reclamation failed he shifted his attention to the Department of Agriculture. Because the Department of Agriculture's Forest Service and Soil Conservation Service had water resource management responsibilities, he tried in 1939 to get the whole Department of Agriculture transferred to the Bureau of Reclamation.

46. Franklin D. Roosevelt to Harold L. Ickes, 21 Nov. 1933; Nixon, *Roosevelt and Conservation,* p. 224.

47. Emmett Sanders, "A Partial History: The Arkansas Basin Association and The Arkansas River Project," unpublished manuscript, copy in District Library Historical Files, Little Rock District; "Tribute to John P. Morrow—He Deserves It," unpublished manuscript, 7 May 1951, copy in Clay, "Notes"; *Batesville News Review,* 27 Sept. 1956; Morrow interview.

48. *Arkansas Gazette,* 30 Dec. 1928.

49. Ibid., 16 Sept. 1931.

50. Alfred M. Lund to Brehon Somervell, 17 Jan. 1933; George C. Merkel to W.A. Hoge, 21 Aug. 1933; W.A. Hoge to George C. Merkel, 7 Apr. 1934; H.B. Ferguson to Division Office, 26 Apr. 1934; W.A. Hoge to E.M. Markham, 27 Apr. 1934; and E.M. Markham to Secretary of War, 7 May 1934, copies of all in Box 10 F.4F286, GAF, RG 77, Fort Worth.

51. Various Letters, 1934-1940, in Box 10 F.4F286, GAF, RG 77, Fort Worth.

52. Gordon R. Clapp, *The TVA: An Approach to the Development of a Region* (Chicago: University of Chicago Press, 1955), p. 301.

53. Raymond Moley, *The First New Deal* (New York: Harcourt, Brace & World, 1966), p. 329; Nixon, *Roosevelt and Conservation,* p. 235.

54. "Muscle Shoals," U.S. Congress, House, *Muscle Shoals,* H.R. 48, 73d Cong., 1st sess., 1933, pp. 10-11.

55. *U.S. Statutes at Large,* vol. 48, pp. 58-72.

56. Morrow interview.

57. Although he does not directly substantiate Robinson's refusal, Wilbur Mills with his lengthy discussion of why Arkansas never wanted to be labeled poor and needy the way Appalachia was gives indirect support to this story [interview, author with Wilbur Mills (former U.S. Representative from Arkansas), Washington, DC, 23 July 1985, tape-recorded interview submitted to Little Rock District 1987 (hereafter cited as Mills interview)].

58. *Arkansas Gazette,* 29 Nov. 1934; Mark Wooten Grobmyer, "An Historical Description Concerning the Development and Construction of the McClellan-Kerr Arkansas River Navigation System" (M.A. thesis, Mar. 1972), copy at the Ouachita Baptist University Library in Arkadelphia, AR.

59. Nixon, *Roosevelt and Conservation,* p. 205.

60. *Arkansas Gazette,* 30 Dec. 1934, 1 Jan. 1935.

61. Ibid., 27 Dec. 1934.

62. Ibid., 11-20 Mar. 1935.

63. Ibid., 5 May 1935.

64. Ibid., 23, and 27 June 1935.

65. Ibid., 11, and 12 June 1935.

66. "Draft Report on Norfork Dam and Reservoir, Arkansas and Missouri, Project Information for Task Force on Water Resources and Power Commission, an Organization of the Executive Branch of Government," unpublished report, n.d., copy on file in 77, 53-66, 83, 800-22, GAF, RG 77, Fort Worth.

67. "Draft Report on Table Rock Dam and Reservoir, White River, Arkansas and Missouri, Project Information for Task Force on Water Resources and Power Commission, an Organization of the Executive Branch of Government," unpublished report, June 1954, copy on file in 77, 53-66, 83, 800-22, GAF, RG 77, Fort Worth.

68. An Appeal to President Roosevelt for Development of the White River Drainage Area in South Missouri and North Arkansas. By the White River League, the County Courts of Barry, Stone and Taney Counties, Missouri, Harrison (Arkansas) Chamber of Commerce, Eureka Springs (Arkansas) Chamber of Commerce, the Monett (Missouri) Commercial Club, and Springfield (Missouri) Chamber of Commerce, 30 Apr. 1935, pp. 1-7, copy at Missouri State Historical Society, University of Missouri, Columbia, MO; *Arkansas Gazette,* 26-28 Apr. 1934, 21 and 29 July 1935, 6 and 17 Aug. 1935.

69. *Arkansas Gazette,* 21 Feb. 1934.

70. "Tribute to John P. Morrow"; *Batesville News Review,* 27 Sept. 1956.

71. *Arkansas Gazette,* 3, and 4 Aug. 1935.

72. Letter, Senator George W. Norris to President Franklin Roosevelt, 3 Jan. 1934, and Letter, Senator Norris to Secretary Ickes, 3 Jan. 1934, as cited in Nixon, *Roosevelt and Conservation,* pp. 237-238; Letter, Colonel Burdick to General Markham, 13 Apr. 1936, copy in D, 8-28, B-10 F.4F296/4, GAF, RG 77, Fort Worth.

73. Howard A. Brown, *Arkansas River Navigation System (Washington,* DC: Library of Congress, Congressional Research Service, 1975).

74. "Preliminary Examination Report, White River, Arkansas," 25 May 1936, 08-28 B17 F.4G158/1, GAF, RG 77, Fort Worth.

75. "Preliminary Examination Report, Arkansas River, Arkansas and Oklahoma," 7 Oct. 1936, 08-28 B10 F.4F296/4, GAF, RG 77, Fort Worth.

76. *U.S. Statutes at Large,* vol. 49, pp. 1508-1513.

77. Congress had used the general welfare clause of the Constitution in the early years of the nineteenth century to justify Corps construction of the National Road, but then abandoned it as the fight over the constitutionality of federal improvements heated up.

78. *U.S. Statutes at Large,* vol. 49, pp. 1508-1513.

79. Ibid., p. 1570.

80. Ibid., pp. 1577-1580.

Notes

Chapter VI

1. Harry A. Woodring to Joe T. Robinson, 9 Dec. 1936, Office of the Chief of Engineers Civil Works, 1923-42, District files, Little Rock, 1092 and 1074, file 1093-3, Box 274, Entry 112, RG 77, Washington National Records Center (WNRC) (Suitland, MD), National Archives. (Collection hereafter cited as Entry 112, RG 77, WNRC.)

2. Files 1093-4, 1093-5, and 1093-6, Entry 112, RG 77, WNRC.

3. Frankes Inc. to Major General Edward M. Markham, 28 June 1937, File 1093-11, Box 274, Entry 112, RG 77, WNRC.

4. Interview, Floyd M. Clay with Earl R. Martin, 23 Aug. 1967, transcript located in Box 209, Little Rock District (hereafter cited as Martin interview); interview, Floyd M. Clay with Herman C. West, 25 Aug. 1967, transcript located in Box 209, Little Rock District (hereafter cited as West interview); interview, Floyd M. Clay with Harry G. Bozarth, 24 May 1967, transcript located in Box 209, Little Rock District (hereafter cited as Bozarth interview).

5. Bozarth interview. The long-term employees who arrived between 1 and 9 July 1937 included six members of the Little Rock District Gallery of Distinguished Civilian Employees: Harry G. Bozarth, Robert L. "Shorty" Baird, Clinton M. Greer, William E. Pilcher, Edward F. Rutt, and Lincoln F. Sherman. Three of the original seven members of the staff were also so honored: Martin, Blakney, and West. For biographies of these individuals see Appendix II.

6. Inactive personnel files, copy in Records Management Office, Little Rock District, Corps of Engineers, Little Rock (collection hereafter cited as Inactive Personnel, Records Management).

7. Bozarth interview.

8. *U.S. Statutes at Large,* vol. 49, pp. 1577-1580. All of the Arkansas and White River basin projects listed—except the Conchos dam and reservoir project, which was already the responsibility of a specially created Tucumcari, New Mexico, District—were the responsibility of the Little Rock District.

9. *Annual Report, 1938,* p. 961.

10. *U.S. Statutes at Large,* vol. 49, pp. 1592, 1594, 1596.

11. This report was published as U.S. Congress, House, Flood Control Committee, H.D. 1, 75th Cong., 1st sess., 1937.

12. *U.S. Statutes at Large,* vol. 52, pp. 1215-1226.

13. Nixon, *Roosevelt and Conservation,* p. 803.

14. *Annual Report, 1938,* pp. 964-1006; U.S. Army Engineer District, Little Rock, "Little Rock District of the Corps of Engineers," unpublished manuscript, n.d., copy in District Library Historical Files, Little Rock District.

15. Martin interview; interview, Floyd M. Clay with Delbert A. Schmand, 25 Aug. 1967, transcript located in Box 209, Little Rock District (hereafter cited as Clay-Schmand interview).

16. Martin interview.

17. General Order 2, Willis E. Teale, 22 Dec. 1938, copy in Box 209, Little Rock District; "History of the Little Rock District," unpublished manuscript, n.d., copy in Box 209, Little Rock District; *Annual Report, 1939,* p. 1048. Captain Lucius D. Clay, who had been in charge of the area for the Little Rock District, was made the first Denison District Engineer. When Denison Reservoir and the large military program were completed the Denison District was consolidated with the established Tulsa District.

18. General Order 3, Willis E. Teale, 4 May 1939, copy in Box 209, Little Rock District; "History of the Little Rock District," Box 209, Little Rock District; *Annual Report, 1940,* pp. 1057, 1101. In August 1935, under the provisions of the Emergency Relief Appropriation Act, the Tucumcari District (in New Mexico) was created to build Conchos Dam and Reservoir (*Annual Report, 1935,* p. 877). In 1939 this District was renamed the Conchos District and enlarged to include responsibility for construction of the Caddoa Dam and Reservoir, which the Little Rock District had started. The Conchos District was itself renamed the Caddoa, Colorado, District and in 1941 was enlarged again and became known as the Albuquerque, New Mexico, Engineer District (General Order 14, E.A. Brown, Jr., 23 Dec. 1941, copy in Box 209, Little Rock District).

19. Strangely enough, as part of this same sequence of events, between March and May 1939, the Corps, at the request of the State Flood Control Commission of Arkansas, considered enlarging the Little Rock District to include Ouachita River basin. This basin was not in the Little Rock District in 1939 because it had not been part of the Memphis District when the Little Rock District was carved out of the Memphis District. The Ouachita River basin had been under the jurisdiction of the Vicksburg District for many years. Wade H. Kitchens, a U.S. House of Representatives member representing southern Arkansas, and many of his constituents opposed the enlargement of the Little Rock District.

Brigadier General H.B. Ferguson, Lower Mississippi Valley Division Engineer, who was in charge of the Vicksburg District, and Colonel Eugene Reybold, Southwestern Division Engineer, who was in charge of the Little Rock District, agreed that the enlargement of the Little Rock District by the transfer of responsibility for the Ouachita River basin to it would be a mistake. No work on the Ouachita River watershed was in any way related to other work the Little Rock District was responsible for. But work in the lower Ouachita watershed directly impacted the Vicksburg District's work on the lower Mississippi. Therefore, Vicksburg should continue to control the Ouachita River basin work as a way of controlling its lower Mississippi River work (Wade H. Kitchens to Harry H. Woodring, 6 April 1939; J.L. Schley to Kitchens, 2 May 1939; and "Questions on Details of Boundary with Vicksburg District," Office of the Chief of Engineers Civil Works, 1923-42, District files, Little Rock, 1092 and 1074, files 1092-13, 1092-14, 1092-15, 1092-16, Box 274, Entry 112, RG 77, WNRC).

20. Fine and Remington, *Corps of Engineers,* p. 123.

21. Ibid., pp. 72-90.

22. *U.S. Statutes at Large,* vol. 49, p. 1597.

23. Roosevelt to Senate, 13 Aug. 1937, in Nixon, *Roosevelt and Conservation,* p. 102. Roosevelt was reluctant to give the Corps all water resource development responsibilities. This reluctance revolved around the concern that the Corps of Engineers' background was not sufficient for the planning of a comprehensive program for the water and related resources of the nation.

24. In September 1940 the United States agreed to transfer to Great Britain 50 obsolete destroyers in return for 99-year leases on a series of British offshore Atlantic bases, from British Guyana to Newfoundland. The two nations also agreed to share in the production of heavy bombers.

25. *Arkansas Gazette,* 7 Jan. 1941.

26. U.S. Congress, House, Flood Control Committee, H.D. 1, 75th Cong., 1st sess., 1937.

27. Ibid.

28. *U.S. Statutes at Large,* vol. 52, pp. 1215-1226.

29. During Fiscal Year 1940 land appraisals and acquisitions of right-of-way, heavy excavation work, foundation explorations, and clearing work were done at Nimrod. In addition, the temporary construction building and shops were largely completed. The annual report for 1940 listed the actual construction as 2 percent completed (*Annual Report, 1940,* p. 1082). According to that same report Clearwater was next furthest along with land appraisals and acquisition of rights-of-way under way, heavy excavation work done, and foundation explorations being performed (ibid., p. 1092). This report further states that the temporary construction buildings and shops were largely completed at Blue Mountain (ibid., p. 1081). At Norfork, although no actual construction was started, preparations for the construction plans and specifications were estimated at 60 percent complete, and the construction of office and shop were substantially complete as was the dam access road and the construction railroad (ibid., p. 1094).

30. *Nimrod Lake* (Washington, DC: U.S. Government Printing Office, 1979), p. 1. Although water began to pool beneficially behind the dam in January 1942, the dam was not completed until March. The project was not officially placed in operation, however, until May [Mississippi River Commission, Office of the President, and Division Engineer, Lower Mississippi Valley Division, *The Corps of Engineers in Arkansas: Civil Works, Navigation and Flood Control* (n.p.: U.S. Army Corps of Engineers, 1950), p. 7]. The information concerning the consequences of the fluctuating lake levels on development is drawn from interview, author with Louis O.D. Kealer, Sr., Nimrod Lake, AR, 17 Nov. 1985. For a discussion of the overall flow of stateside military construction, see Fine and Remington, *Corps of Engineers,* p. 586.

31. "Extract Report of the Little Rock District," in *Annual Report, 1985,* p. 18-6.

32. *U.S. Statutes at Large,* vol. 52, pp. 1215-1226.

33. "Draft Report on Norfork Dam and Reservoir," copy in Box 209, Little Rock District (hereafter cited as Draft Report, Norfork); "Report on Nimrod Dam and Reservoir," unpublished manuscript, 1977, p. 1, copy in Box 209, Little Rock District.

34. *U.S. Statutes at Large,* vol. 55, pp. 638-651.

35. Bozarth interview.

36. The District files for 1954 contain a great deal of correspondence concerning the Little Rock District's operation of both Norfork and Bull Shoals. The local residents opposed fluctuations in the size of the lakes. They contended that the lowering of water levels, or what are called drawdowns, were intended to increase the projects' output of hydroelectric power at the expense of the more local economic benefits flowing from recreational use of the facilities. Republican State Chairman Ben C. Henley and the head of the Mountain Home Chamber of Commerce, Pete Shiras, as well as William R. Beeson of the Ozark Lakes and Rivers Association put a lot of pressure on Colonel Stanton L. Brown, then Little Rock District Engineer, to make a policy that the District would not lower the levels of these two lakes appreciably unless it was absolutely necessary. After lengthy discussions between Colonel Brown and the Division office in Dallas such a policy was brought into tacit existence. The bulk of the correspondence concerning this issue is contained in File 821.3, Boxes 82 and 84, GAF, RG 77, Fort Worth, including Wm.R. Beeson and Pete Shiras to Colonel Stanton, 18 Aug. 1954; Colonel Brown to Pete Shiras, 19 Aug. 1954; Colonel Brown to Ben C. Henley, 28 Aug. 1954; L.G. Seeman to Missouri Governor Phil M. Donnelly, 24 Sept. 1954. The information that the policy was intended to maximize hydroelectric power generation capabilities and not recreational use was provided by Joe Clements, Chief, Information Requirements and Planning Branch, Information Management Office, Little Rock District, in written comments on a draft of this manuscript.

37. "Extract Report of the Little Rock District," in *Annual Report, 1986,* p. 18-9.

38. Draft Report, Norfork.

39. Interview, Floyd M. Clay with Dalton Green, 12 July 1967, transcript in Box 209, Little Rock District (hereafter cited as Green interview).

40. In 1985 the Corps was studying activating two more generating units at Norfork [interview, author with B.R. Self (Chief, Norfork Power Plant), Norfork Powerhouse, AR, 21 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Self interview)]. To that time Norfork, just as all high-head hydroelectric power plants in the District, had been used as a "peaking plant."Hydropower plants are easier and more economically started and stopped than other power-generating plants. So high-head hydroelectric power plants that store their power source behind their own dams ready to be tapped whenever necessary—as opposed to low-head, run-of-the-river plants—are often used only at hours of peak demand for electricity by consumers [Interview, author, with C.P. Crippen (Chief, Hydropower Branch, Mountain Home District Office), Bull Shoals Powerhouse, 21 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Crippen interview)]. For the additional two generating units to be cost-effective

they would need to be run virtually all the time, like a steam or nuclear plant. To do this without depleting the Norfork Reservoir in a very short time, they would need to use "pump-back technology." That is, the water run through the generators in the daytime high-demand hours would need to be pumped back upstream into the reservoir during the low-demand nighttime hours. The power generated by these two generators would be used to power the pumps at night and be distributed to consumers during the day. In addition to being complicated and delicate from not only a technological but also financial standpoint, this process might endanger the downstream trout fishery (Self interview).

41. "Extract Report of the Little Rock District," in *Annual Report, 1986,* p. 18-9; Crippen interview.

42. George R. Schneider, *The History and Future of Flood Control* (Little Rock: U.S. Army Engineer District, 1952).

43. U.S. Congress, House, H.D. 917, 76th Cong., 3d sess., 1940.

44. *U.S. Statutes at Large,* vol. 55, pp. 638-651.

45. Between 1941 and 1943 the Little Rock District built Adams Field in Little Rock; Barksdale Field at Barksdale Air Force Base; Bentonville Field at Bentonville, Arkansas; Biggers Auxiliary Field; Blytheville Airfield at Blytheville, Arkansas; Corning Airfield, Arkansas; Damascus Airfield; DeSoto Parish Airport, Mansfield, Louisiana; El Dorado Airport, Arkansas; Hazen Auxiliary Field; Hot Springs Airport, Hot Springs, Arkansas; Magnolia Airport; Monroe Airport; Natchitoches Municipal Airport; Newport Air Force Training School and its five auxiliary fields (Amagon, Elgin, Erwin, Milltown, and Weldon); Pollack Airfield in Alexandria, Louisiana; Rogersville Airfield in Rogersville, Missouri; Selman Field; Stuttgart Air Force Advanced Training School and its three auxiliary fields (Roe, Goldman, and Praireville); Tuckerman Airfield; Van Buren Airfield; Van Buren-Oak Grove Airport; Walcott Auxiliary Field; and Walnut Ridge-Walcott [Little Rock District, Corps of Engineers, *Military Construction Projects, Little Rock District: Layouts* (Little Rock: U.S. Army Engineer District, 1943); War Projects 1942, File 1336, Box 275, Entry 112, RG 77, WNRC].

46. The Wilcox Act was signed by President Roosevelt in August 1935.

47. Armstrong, *History of Public Works,* pp. 626-627.

48. "Brief History," 10 May 1955, cited in Clay, "Notes"; Fine and Remington, *Corps of Engineers,* pp. 495-497.

49. Fine and Remington, *The Corps of Engineers,* p. 133.

50. Clay-Schmand interview.

51. Armstrong, *History of Public Works,* p. 628; Clay-Schmand interview.

52. Ibid.

53. Armstrong, *History of Public Works,* pp. 188-216.

54. U.S. Air Force, Historical Division, Research Studies Institute, "Brief History of Blytheville Air Force Base, 1942-1956," unpublished report, 1956, pp. 1-2, copy in Wing Historian's Office, 97th Bombardment Wing, Blytheville Air Force Base, Blytheville, AR.

55. Ibid., p. 3.

56. Ibid., p. 4.

57. *Arkansas Gazette,* 2 Feb. 1941.

58. Fine and Remington, *Corps of Engineers,* pp. 470-472; Armstrong, *History of Public Works,* p. 598.

59. Fine and Remington, *Corps of Engineers,* pp. 88-90, 471.

60. Ibid., p. 131. In some cases land for new or enlarged installations did not even have to be purchased, the federal government already owned it. Some military construction project sites in the District had been used repeatedly since the mid-1800s for successive Army installations. For example, Little Rock had been the site of an arsenal since at least the 1860s. After 1873 this facility became known as "The Barracks" on Fort Logan H. Roots. World War II's Camp Robinson was simply World War I's Camp Pike renamed and updated. Illustrations of the earliest of these changes are in Prints: American Forts 1860-1914 [Box 1 of 10, RG 111 SC, NA, Washington, DC (collection hereafter cited as Forts, RG 111 SC)]. The federal government also already owned land in the District used for non-Army war projects. For example, Jerome and Rohrer Japanese relocation camps were built on land originally purchased by Rex Tugwell's Farm Security Administration as sites for further subsistence homesteads for low-income southern farm families [Roger Daniels, *Concentration Camps: Japanese Americans and World War II* (New York: Holt, Rinehart & Wilson, 1972), p. 92].

61. Mills interview; interview, author with J. William Fulbright (former U.S. Senator from Arkansas), Washington, DC, 18 July 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Fulbright interview).

62. Interview, Floyd M. Clay with Carl Garner, 10 July 1967 (hereafter cited as Clay-Garner interview); interview, author with W. Carl Garner (Resident Engineer, Greers Ferry Lake Resident Office), Heber Springs, AR, 22 Nov. 1985, tape-recorded interview submitted to Little Rock District 1987 (hereafter cited as Garner interview); list of Little Rock District Military Maps, copy in McClellan Papers.

63. Fine and Remington, *Corps of Engineers,* p. 211.

64. Ibid.

65. Ibid.

66. "History of Fort Chaffee," unpublished report, n.d., p. 1, copy in Public Affairs Office, Fort Chaffee, Fort Smith, AR.

67. Ibid.

68. Field notes; Military Construction Project Files, 1941-1943, Box 19, RG 77, Federal Archives and Records Center, Fort Worth, TX (collection hereafter cited as MCPF, RG 77, Fort Worth).

69. Clay-Schmand interview.

70. Jeffery A. Hess, "Historic Properties Report: Pine Bluff Arsenal, Pine Bluff, Arkansas," Aug. 1984, copy in files of MacDonald and Mack Partnership, Minneapolis, MN; "History of Pine Bluff Arsenal," MCPF, Box 1, RG 77, Fort Worth; Duane Huddleston, "Building the Little Rock Arsenal," *Pulaski County Historical Review* 20 (Dec. 1972):45-47.

71. Fine and Remington, *Corps of Engineers,* p. 565.

72. Bozarth interview.

73. Schmand interview.

74. "History of the Corps of Engineers Activities Relating to the Current Mobilization Period, Southwest Division and Districts, 25 June 1950 through 8 Sept. 1951," unpublished manuscript, 26 Oct. 1951 (hereafter cited as "History Mobilization 1950-1951"); Memorandum, Korean War Mobilization History, 9 May 1951, Box 29, GAF, RG 77, Fort Worth (hereafter cited as Korean Mobilization).

75. S.L. Scott to District Engineer, Little Rock, 30 Jan. 1941, copy in Records Management Reference Files, Records Management Office, Little Rock District, Little Rock; *Arkansas Gazette,* Jan. 1941.

76. Conducted under the authority of the Rivers and Harbors Act of 1935 and the Flood Control Act of 1938, this review was ordered by a 12 October 1938 resolution of the Senate Commerce Committee and a 24 January 1939 House Committee resolution (Brown, *Arkansas River Navigation System,* p. 8).

77. Clay-Garner interview; Stiles interview; "Brief History 10 May 1955," cited in Clay, "Notes."

78. John McClellan to A.C. McCutchen, 8 Oct. 1943; Arkansas-White Basin Act file; and F.D. Roosevelt to Senator McClellan, 14 Jan. 1944, all in McClellan Papers. Nixon,

Roosevelt and Conservation, pp. 15, 68-69, 409, 492, 557; *Arkansas Gazette,* Jan. 1941.

79. *U.S. Statutes at Large,* vol. 58, pp. 887-907.

80. Ibid.

81. D. Clayton Brown coined this term. Dr. Brown is a professor of history at Texas Christian University and the author of *Western Tributaries of the Mississippi,* cited above, and of *Rivers, Rockets and Readiness: Army Engineers in the Sunbelt: A History of the Fort Worth District U.S. Army Corps of Engineers,* 1950-1975 (Fort Worth: U.S. Army Engineer District, 1979). As of this writing, he is working on a history of the Southwestern Division of the Corps of Engineers [interview, David W. Vannoy with D. Clayton Brown, Fort Worth, TX, 24 Sept. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Brown interview)].

Notes

Chapter VII

1. *Annual Report, 1946,* p. 1250.
2. *Annual Report, 1947.*
3. "Extract Report of Little Rock District," in *Annual Report, 1985,* p. 18-5.
4. *Annual Report, 1946,* p. 1255.
5. *Annual Report, 1949.*
6. Telephone interview, David W. Vannoy with John Risinger, 15 Nov. 1985, interview notes submitted to Little Rock District, 1987.
7. "Extract Report of Little Rock District," in *Annual Report, 1985,* p. 18-5.
8. *Annual Report, 1949.*
9. "Resume of Construction Operations, Bull Shoals Dam, White River," unpublished report, Oct. 1947, p. 1, copy in personal files of Jesse W. Story, Ozark, AR.
10. Ibid.; *Bull Shoals Dam, Completion Report of Construction of Dam, Contract No. W-03-050-EN6-461* (Little Rock: U.S. Army Engineer District, 1953); Southwestern Division, *Water Resource Development in Arkansas 1981,* p. 73; Garner interview; Clay-Garner interview; "Harvey Slocam Builds Our Mighty Dams," *Colliers,* 5 May 1951.
11. "Resume of Construction Operations, Bull Shoals"; *Bull Shoals Dam, Completion Report.*
12. Interview, author with Jesse W. Story (former Resident Engineer, Little Rock District), Ozark, AR, 19 Nov. 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Story interview); clipping file for *Baxter Bulletin* in Mountain Home Public Library, Mountain Home, AR.
13. Crippen interview.
14. *Bull Shoals Dam, Completion Report;* "On Line Times and Dates for All Generations," unpublished report, n.d., copy in Operations Office files, Little Rock District, Little Rock.
15. "Extract Report of Little Rock District," in *Annual Report, 1986,* p. 18-8.
16. Bull Shoals like Norfork was designed to fluctuate from a low-water pool to a high-water pool about 25,000 acres larger than the low-water pool. The decision to keep it relatively stable was made in conjunction with the decision to keep Norfork stable (see Chapter VI and Chapter VI, note 36).
17. Interview, Floyd M. Clay with Tom Dearmore, 12 July 1967 (hereafter cited as Dearmore interview).
18. Story interview.
19. John A. Jackle, *The Tourist: Travel in Twentieth Century North America* (Lincoln: University of Nebraska Press, 1985), pp. 146-170.
20. Ibid.; Dearmore interview; *Little Rock District Employee Letter,* 3 Feb. 1959, as cited in Clay, "Notes."
21. Ibid.
22. Interview, author with Glen Priebie (Assistant Manager, Bull Shoals Project), Mountain Home, AR, 21 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Priebie interview).
23. Ibid.; Story interview; Dearmore interview; interview, author with Jack H. Wilson (Resident Engineer, Mountain Home Resident Office), Mountain Home, AR, 21 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Wilson interview); U.S. Army Engineer District, Little Rock, "Financial and Statistical Report, Recreation Activities, Bull Shoals Reservoir Area, 1966," and "Financial and Statistical Report, Recreation Activities, Norfork Reservoir Area, 1966," unpublished reports, copies of both in Box 209, Little Rock District files.
24. "History Mobilization 1950-1951"; Korean Mobilization; Weekly Conference Report, 30 Nov. 1950, U.S. Army Commands, 1942, File 337, Box P-52647, RG 338, WNRC (collection hereafter cited as RG 338, WNRC).
25. Hess, "Pine Bluff Arsenal," p. 36; Jesse W. Story to Ted Cook, 8 Oct. 1986, copy in Little Rock District files.
26. Conversation, Judy Lester with Joe Clements (Chief of Information Requirements and Planning Branch, Information Management Office, Little Rock District), Little Rock, AR, 10 June 1987.
27. Story to Cook, 8 Oct. 1986.
28. Ibid.; Hess, "Pine Bluff Arsenal," p. 36.
29. Major General L.A. Pick to Thomas F. Farrell, 12 Oct. 1951; George F. Meier to Division Engineer, 4 Dec. 1951; and Arthur W. Stanley to Division Engineer, 7 Dec. 1951, all in 53-66, Box 32, GAF, RG 77, Fort Worth.
30. *Arkansas Gazette,* 31 Mar. and 12 Apr. 1961.
31. Second Lieutenant Debra J. Faber, ed., *Little Rock Air Force Base: Silver Anniversary Review, 1955-1980* (Jacksonville, AR: 314th Tactical Air Wing Public Affairs Office, 1980), pp. 8-11.
32. Ibid., p. 11.

33. Ibid., p. 12.
34. Ibid., p. 25.
35. Ibid., p. 12.
36. Ibid., pp. 12-15.
37. Ibid., p. 15
38. Ibid., pp. 20-28.
39. Ibid., pp. 25-28.
40. E.W. Reely to Division Engineer, 5 Jan. 1959, MCPF, Box 14, RG 77, Fort Worth; Green interview.
41. *Annual Report, 1961,* vol. 1, p. 51; Department of the Army, General Order 12, 28 Apr. 1961; Green interview.
42. *U.S. Statutes at Large,* vol. 49, pp. 1596, 1580.
43. U.S. Congress, House, H.D. 917, 76th Cong., 3d sess., 1940.
44. *U.S. Statutes at Large,* vol. 55, pp. 638-651.
45. Interview, Floyd M. Clay with Tom Epps, 13 July 1967, transcript in Box 209, Little Rock District (hereafter cited as Epps interview).
46. Southwestern Division, *Water Resource Development in Arkansas, 1981,* pp. 73, 79.
47. Ibid., pp. 73, 77, 79.
48. "Extract Report of Little Rock District," in *Annual Report, 1985,* pp. 18-9, 18-10.
49. Story interview; Condry interview; interview, Floyd M. Clay with Ben Parnell, 14 July 1967, transcript in Box 209, Little Rock District (hereafter cited as Parnell interview).
50. "What Happened to Lake Regulations That Started Table Rock off as the Fastest-Developing Lake in the U.S.A.?," *Stone County Republican,* 4 Feb. 1960.
51. Condry interview.
52. Table Rock Development Committee, "Testimony and Supporting Documents Requesting Clearing of Table Rock Reservoir, Submitted to the Corps of Engineers, U.S. Army, at Public Hearing, Branson, Missouri, 12 September 1956," copy at the Missouri State Historical Society, University of Missouri, Columbia, MO.
53. U.S. Congress, House, Flood Control Committee, H.D. 1, 75th Cong., 1st sess., 1937; *U.S. Statutes at Large,* vol. 52, pp. 1215-1226.
54. U.S. Federal Commerce Commission Resolution, 3 April 1940.
55. "Statement of the Views of the Cleburn County and the Heber Springs, Arkansas, Delegations at the Public Hearing at Little Rock, Arkansas, Relative to the Construction of a Multiple-Purpose Reservoir on the Little Red River, at Greers Ferry, Arkansas," cited in Clay, "Notes." *U.S. Statutes at Large,* vol. 68, pp. 1215-1267.
56. "Greers Ferry Dam at Halfway Mark," *The EM-Kayan,* March 1961.
57. U.S. Army, Corps of Engineers, Little Rock District, *Greers Ferry Lake* (Little Rock: U.S. Army Engineer District, n.d.).
58. Clay-Garner interview; Gunelda Ann Martin, "Suspension Bridge Was a Swinging Oddity," as cited in Clay, "Notes."
59. Interview, author with Charles D. Maynard, Little Rock, 16 Oct. 1985 (hereafter cited as Maynard interview).
60. U.S. Army, Corps of Engineers, Little Rock District, *Employee Newsletter,* Oct. 1957; U.S. Army, Corps of Engineers, Little Rock Dictrict, *Norfork Lake* (Little Rock: U.S. Army Engineer District, n.d.); Southwestern Division, *Water Resource Development in Arkansas 1981,* pp. 75, 77.
61. Weekly Conference Report, 6 Mar. 1950, File 337, Box P-52647, RG 338, WNRC.
62. *U.S. Statutes at Large,* vol. 49, pp. 666-668.
63. Francis P. McManamon, "Federal Archeology and Historic Preservation: The Impact of the National Historic Preservation Act," in *With Heritage So Rich* (Washington, DC: National Park Service and National Trust for Historic Preservation, 1986), p. 814.
64. Ibid.
65. Erik Reed to Hans Holmer, 9 Feb. 1954; and Reed to Joe Clema, 2 Mar. 1954, both in Box 84, GAF, RG 77, Fort Worth; Tom Thiessen to John W. Anderson, 25 July 1975, copy in District Archeologist's Files, Little Rock District.
66. Davis, "History of Archeological Research in Arkansas," p. 17.
67. Warren W. Caldwell's 1958 report, "Archeological Investigation in the Dardanelle Reservoir, West Central Arkansas," is an example of direct Smithsonian staff work (copy in District Archeologist's Files, Little Rock District).
68. Comptroller General of the United States, *Report to the Chairman, Committee of Interior and Insular Affairs House of Representatives of the United States: Are Agencies Doing Enough or Too Much for Archeological Preservation? Guidance Needed* (Washington, DC: General Accounting Office, 1981), p. 2.
69. Davis, "History of Archeological Research in Arkansas," p. 19.
70. *U.S. Statutes at Large,* vol. 58, pp. 887-907.
71. U.S. Congress, House, H.D. 758, 79th Cong., 1945, p. 96.
72. Interview, author with Dr. Fred Bushman (Environmental Scientist, Environmental Resources Branch, OCE), Washington, DC, 18 July 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Bushman interview).
73. U.S. Army, Corps of Engineers, Little Rock District, *Nimrod Lake: Project Manual* (Little Rock: U.S. Army Engineer District, n.d.), p. 1.
74. E.C. Itschner to William Whipple, 30 June 1958, Box 864, GAF, RG 77, Fort Worth.
75. "Study of Uniform Procedures for Operators in Handling the Public at Reservoirs of the Corps of Engineers, Little Rock District," unpublished report, n.d., copy in Box 864, GAF, RG 77, Fort Worth.
76. *U.S. Statutes at Large,* vol. 72, p. 564.
77. Casto, "The Corps Permit Authority as a Tool for the Environment," p. 10; interview, author with Dr. John Belshe (Chief, Environmental Branch, OCE), Washington, DC, 18 July 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Belshe interview).
78. Pearson-Huson interview.
79. *Arkansas Gazette,* 10 Jan. and 5, 7, and 12 Feb. and 31 Aug. 1960, and 16 June 1966; *Arkansas Democrat,* 14, 20, and 26 Jan., 12 Feb., and 11 Mar. 1960; *Greers Ferry Gazette,* 27 Jan. and 16 and 23 Mar. 1960; *Cleburne County Times,* 9 Mar. 1961; Clay-Garner interview; Garner interview; Maynard interview; File 3, Box 8, [William J.] Allen Ecology Records, Archives and Special Collection, University of Arkansas at Little Rock (collection hereafter cited as Allen Ecology Records).
80. U.S. Army, Corps of Engineers, Little Rock District, *Twentieth Anniversary Ceremony Commemorating the October 1963 Dedication of Greers Ferry Dam and Lake by President John F. Kennedy,* souvenir pamphlet, copy in files of Greers Ferry Resident Office, Heber Springs, AR.
81. Southwestern Division, *Water Resource Development in Arkansas, 1981,* p. 75.
82. "Extract Report of the Little Rock District," in *Annual Report, 1986,* p. 18-9.
83. Southwestern Division, *Water Resource Development in*

Arkansas, 1981, p. 75.

84. "Extract Report of the Little Rock District," in *Annual Report, 1986,* p. 18-9.

85. "Address by President John F. Kennedy, Dedication of Greers Ferry Dam, Heber Springs, Arkansas, 3 October 1963," reprinted in U.S. Army, Corps of Engineers, Little Rock District, *Twentieth Anniversary Dedication of Greers Ferry,* p. 3.

86. Mills interview.

87. *New York Times,* 3 Oct. 1963.

88. "Address by Kennedy," p. 7.

89. *Arkansas Gazette,* 17 Jan. 1960.

90. Pearson-Huson interview.

91. U.S. Congress, House, Flood Control Committee, H.D. 1, 75th Cong., 1st sess., 1937.

92. *U.S. Statutes at Large,* vol. 52, pp. 1215-1226.

93. See note 91 above.

94. *Marshall Mountain Wave,* 23 Aug. 1962.

95. Interview, Floyd M. Clay with Gibson Walsh and James R. Tudor, 10 Aug. 1967, transcript located in Box 209, Little Rock District (hereafter cited as Walsh-Tudor interview).

96. Maynard interview; Walsh-Tudor interview.

97. *Marshall Mountain Wave,* 1228 June and 3 May 1962.

98. Dearmore interview.

99. Walsh-Tudor interview; *Marshall Mountain Wave,* 1962-1970.

100. *Marshall Mountain Wave,* 5 Nov. 1964.

101. Walsh-Tudor interview.

102. *Arkansas Gazette,* 16 Apr. 1966.

103. *Marshall Mountain Wave, Rogers Daily News,* and *Baxter Bulletin,* all on 7 May 1968.

104. *U.S. Statutes at Large,* vol. 82, pp. 906-918.

105. Jerol Garrison, "Corps Endorses Plan for the Buffalo River," *Arkansas Gazette,* 13 June 1971.

106. *Arkansas Gazette,* 17 Sept. 1977.

107. Maynard interview; *Daily Democrat Courier,* 18 Sept. 1977; "News Release: Two Corps of Engineers Water Projects in Little Rock District De-Authorized," copy in File 18, Box 210, Records Management Files, Little Rock.

108. Southwestern Division, *Water Resource Development in Arkansas 1981,* p. 81.

109. *Annual Report, 1945; U.S. Statutes at Large,* vol. 68, pp. 1256-1267.

110. Interview, author with Bob Garner (Facility Manager, Beaver Lake) and James D. Baird (Lake Manager, Beaver Lake), Rogers, AR, 17 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Bob Garner and Baird interview); "Extract Report of the Little Rock District," *Annual Report, 1985,* p. 18-7.

111. Southwestern Division, *Water Resource Development in Arkansas 1981,* p. 81.

112. "Extract Report of the Little Rock District," *Annual Report, 1985,* p. 18-7.

113. Southwestern Division, *Water Resource Development in Arkansas 1981,* p. 81; *Springfield News and Leader,* 15 Aug. 1965; Garner interview.

114. See note 113 above; "Extract Report of the Little Rock District," *Annual Report, 1985,* pp. 18-5, 18-6, 18-8.

115. Interview, author with Charles L. Steel (former Little Rock District Engineer), Little Rock, 15 Oct. 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Steel interview); Mills interview; Maynard interview.

Notes

Chapter VIII

1. The plan is set forth in U.S. Congress, House, H.D. 758, 79th Cong., 1st sess., 1945.

2. See Chapter IV.

3. Brown, *Arkansas River Navigation System,* p. 8; Maynard interview.

4. Brown, *Arkansas River Navigation System,* p. 7; H.D. 758, 79th Cong., 1st sess., 1945.

5. Maynard interview; Brown, *Arkansas River Navigation System,* p. 8.

6. General Eugene Reybold to Secretary of War, 20 Sept. 1945, copy in File 5, Box 6, Series II, Fletcher-Terry Papers, Archives and Special Collection, University of Arkansas at Little Rock, (hereafter cited as Fletcher-Terry Papers).

7. See Chapter IV.

8. Brown, *Arkansas River Navigation System,* pp. 8-9.

9. Speech, Charles Long, Jan. 1959, as cited in Clay, "Notes"; H.D. 758, 79th Cong., 1st sess., 1945.

10. Brown, *Arkansas River Navigation System,* pp. 6-7; and H.D. 758, 79th Cong., 1st sess., 1945.

11. The fact that this study was instigated at General Reybold's request is contained in Brown, "Southwestern Division History" (draft), Chapter 7, note 16, p. 225.

12. Speech, Colonel Staunton L. Brown, 18 July 1957, as cited in Clay, "Notes"; Brown, *Arkansas River Navigation System,* p. 14; speech, Major General E.C. Itschner, Dardanelle construction project 1959 groundbreaking, copy of text in Box 209, Little Rock District.

13. Brown, *Arkansas River Navigation System,* p. 8.

14. Ibid.

15. E.C. Itschner to William Whipple, 30 June 1958, Box 864, GAF, RG 77, Fort Worth.

16. U.S. Congress, House, H.R. 6407, 79th Cong., 1st sess., 1946.

17. Brown, *Arkansas River Navigation System,* p. 9.

18. Ibid.

19. Sanders, "Partial History," p. 2.

20. David Cushman Coyle, *Conservation: An American Story of Conflict and Accomplishment* (New Brunswick, NJ: Rutgers University Press, 1957), p. 141.

21. Conference Report, 4 May 1950, File 337, Box p-52647, RG 338, WNRC.

22. U.S. Congress, House, Committee on Public Works, Subcommittee To Study Civil Works, *Hearings, Study of Civil Works, Part 1, Corps of Engineers, U.S. Army,* 82d Cong., 2d sess., 30 Mar. and 2, 3, 29 Apr. 1952.

23. Arms of Service and Department Memo, 17 Apr. 1952; and Circular letter, Lewis A. Pike, Office of the Chief of Engineers, 5 May 1952, both in RG 77, Fort Worth; J.G. Burke to Francis Cherry, 17 Feb. 1953; and Francis Cherry to President Eisenhower, 25 Feb. 1953, both in Francis Cherry Official Papers, 1952-1954, Arkansas Historical Commission, Little Rock (collection hereafter cited as Cherry Papers).

24. *U.S. Statutes at Large,* vol. 62, pp. 1175-1182.

25. Ibid., vol. 64, pp. 170-184.

26. Ibid.; Brown, *Arkansas River Navigation System,* p. 12.

27. Brown, *Arkansas River Navigation System,* p. 12.

28. Schneider, *History of Flood Control,* pp. 89-91; File 9, Box 3, Allen Ecology Records; Brown, "Southwestern Division History," pp. 48-49.

29. Brown, "Southwestern Division History," p. 49.

30. Report, "AWRBIAC Conference in the Southwestern Division Office," typescript, 14 Aug. 1950, Box 273, RG 77, Fort Worth, as cited in ibid., p. 50.

31. Ibid.

32. Ibid., p. 51.

33. Ibid., pp. 51-52.

34. Ibid., p. 49; T.J. Hayes to Francis Cherry, 7 Aug. 1953, Cherry Papers.

35. Brown, "Southwestern Division History," p. 52.

36. Ibid, p. 53.

37. Ibid., pp. 52-53.

38. *Arkansas Gazette,* 15 Jan. 1952; Brown, "Southwestern Division History," p. 139.

39. Brown, "Southwestern Division History," p. 139.

40. Quoted in William B. Settle, Jr., *The Dawning: A New Day for the Southwest. A History of the U.S. Army Corps of Engineers,* Tulsa District (Tulsa, OK: U.S. Army Engineer District, 1975), p. 94.

41. Brown, "Southwestern Division History," p. 139.

42. *U.S. Statutes at Large,* vol. 69, pp. 354-365.

43. Brown, "Southwestern Division History," p. 140.

44. Presidential Budget Message of 1956, as quoted in Brown, *Arkansas River Navigation System,* p. 13.

45. Brown, "Southwestern Division History," pp. 140-41.

46. *U.S. Statutes at Large,* vol. 69, p. 354.

47. Brown, "Southwestern Division History," p. 141.

48. Brigadier General William Whipple, Jr., unpublished memoirs, as cited in ibid., p. 142.

49. Brown, "Southwestern Division History," p. 143.

50. Ibid., p. 144.

51. Ibid.

52. *U.S. Statutes at Large,* vol. 74, pp. 488-503.

53. Southwestern Division, *Water Resource Development in Arkansas 1981,* p. 12.

54. Maynard interview. The example is Colonel Maynard's. In reality the working out of the division of responsibility was perhaps not as easy as this statement implies. A considerable amount of correspondence deals with the assignment of functions between the two engineering and operations divisions regarding lock and dam development in the Arkansas River project (files 1520-1603, Box 864, Records Management Office, Little Rock District, Little Rock).

55. Maynard interview.

56. Speech, Colonel Staunton L. Brown, 18 July 1957, as cited in Clay, "Notes"; Brown, *Arkansas River Navigation System,* p. 14; speech, Major General E.C. Itschner, 1959, copy of text in Box 209, Little Rock District.

57. Brown, *Arkansas River Navigation System,* p. 14.

58. Interview, author with Carmie Henry (former member of Senator McClellan's staff and present member of Senator Prior's staff), Little Rock, 16 Oct. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Henry interview).

59. *Arkansas Gazette,* 21 Jan. 1962.

60. Several studies of the Area Development Administration and the Appalachian regional development act exist. This study draws on Monroe Newman, *The Political Economy of Appalachia: A Case Study in Regional Integration* (Lexington, MA: D.C. Heath & Co., 1972); Donald N. Rothblatt, *Regional Planning: The Appalachian Experience* (Lexington, MA: D.C Heath & Co., 1971); and Janet Whitney Patton, "The State Development Planning Process: Implementation of the Appalachian Regional Development Act of 1965 in West Virginia" (Ph.D. diss., University of California-Berkeley, 1970).

61. Henry interview.

62. Interview, author with John C. Dalrymple (former Little Rock District Engineer), Alexandria, VA, 24 July 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Dalrymple interview); *Little Rock District Employee Information Bulletin,* Jan. 1962; Clay, *Little Rock District,* pp. 76-77.

63. Wilbur Mills implied that the whole struggle between 1946 and 1963 to get adequate appropriations to begin construction on the Arkansas River improvement project was merely a subterfuge. It kept local river improvement advocates from expressing anger at the Corps by focusing their attention on other groups and institutions, groups they believed were responsible for obstructing funding. Mills stated that the funding in this project, as in most projects, came as soon as the Corps was ready to use it. In this case, he implied it was not coincidental that appropriations sufficient to get construction under way were timed so that Little Rock District could shift its staff from the last of the reservoir projects to these river projects (Mills interview).

64. *Annual Reports, 1963-1966.*

65. Maynard interview; *Annual Report, 1963;* Ben Combs, *Arkansas River,* motion picture produced by KATV, 5 Oct. 1968.

66. Colonel Staunton Brown, "Multiple-Purpose Plan for Arkansas Basin: Projects, Problems, and Progress, Little Rock District, Corps of Engineers," unpublished paper, 14 Nov. 1956, copy in Box 209, Little Rock District.

67. Little Rock and Tulsa Engineer Districts, *Guide to the McClellan-Kerr Arkansas River Navigation System,* p. 15. The Vicksburg District apparently did the initial planning for this work in the 1950s ("Statement by Colonel Milton P. Barsgidorf, District Engineer, Vicksburg District, Corps of Engineers, before AWRBIAC, 14 November 1956," unpublished typescript, copy in Box 209, Little Rock District).

68. Little Rock and Tulsa Districts, *Guide to the McClellan-Kerr Navigation System,* p. 15. Much of the actual bank stabilization and rectification work between Pine Bluff and the Mississippi River was actually done by the Vicksburg District ("Statement by Col. Barsgidorf").

69. Little Rock and Tulsa Districts, *Guide to the McClellan-Kerr Navigation System,* p. 18; Clay, *Little Rock District,* p. 80.

70. Little Rock and Tulsa Districts, *Guide to the McClellan-Kerr Navigation System,* p. 18.

71. Ibid.; written comments on manuscript draft of April 1987 by Joe Clemmnts, Chief, Information Requirements and Planning Branch, Information Management Office, Little Rock District.

72. Interview, author with F.L. Young (Superintendent, Dardanelle Powerhouse), Russellville, AR, 18 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Young interview).

73. Brown, *Arkansas River Navigation System,* p. 15; *Arkansas Gazette,* 2, and 3 June 1967.

74. *Arkansas Gazette,* 31 Dec. 1968, and 1 Jan. 1969.

75. Ibid., 4 Jan. 1969; Brown, *Arkansas River Navigation System,* p. 15; Clay, *Little Rock District,* p. 83.

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77. Bureau of Business and Economic Research, College of Business Administration, University of Arkansas, Fayetteville, *Regional Response Through Port Development: An Economic Case Study on the McClellan-Kerr Arkansas River Project* (Springfield, VA: National Technical Information Service, 1974), pp. 3, 13; Steel interview; Maynard interview; Mills interview.

78. Steel interview; Maynard interview.

79. Steel interview.

80. Bureau of Business and Economic Research, *Port Development,* p. 3.

81. Little Rock and Tulsa Engineer Districts, *Guide to the McClellan-Kerr Navigation System,* p. 37; Bureau of Business and Economic Research, *Port Development,* p. 3.

82. Bureau of Business and Economic Research, *Port Development,* pp. 76-79, 98-103.

83. *W.D. Mayo (Okla.) and No. 13 (Ark.) Locks and Dams* (Tulsa, OK: U.S. Army Engineer District, 1972).

84. Little Rock and Tulsa Engineer Districts, *Guide to the McClellan-Kerr Navigation System,* p. 37; Bureau of Business and Economic Research, *Port Development,* pp. 3 and 110-118.

85. See note 84 above.

86. Maynard interview.

87. Ibid.; Clay, *Little Rock District,* pp. 85-86.

88. *Lock and Dam No. 9 and Toad Suck Ferry Lock and Dam* (Little Rock: U.S. Army Engineer District, 1979).

89. Guy W. Murphy to Colonel Frank Bane, 30 Sept. 1960, copy in File 2, Box 210, Records Management Office, Little Rock District.

90. *Arkansas Gazette,* Sept. 1970; Clay, *Little Rock District,* pp. 85-86; Public Law 91-649.

91. Bureau of Business and Economic Research, *Port Development,* pp. 104-106.

92. "Tube Turbines to Provide Power at These Industrial

and Utility Hydro Installations . . . ,'' copy of article [from a piece of Allis-Chalmers promotional literature], in Operations Office Files, Little Rock District Headquarters, Little Rock; William Moore, Chief, Electrical Engineering, written comments, Little Rock District.

93. See note 92 above.

94. See note 92 above; Brown, ''Southwestern Division History,'' p. 182.

95. Brown, ''Southwestern Division History,'' pp. 183-184.

96. Ibid., pp. 185-186.

97. Maynard interview; Crippen interview; Clay, *Little Rock District,* p. 94; interview, author with C.D. Lassiter (Resident Engineer, Russellville Resident Office), Russellville, AR, 18 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Lassiter interview); interview, author with R.L. Lovelace (Superintendent, Ozark Power Plant), Ozark, AR, 19 Nov. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Lovelace interview).

98. Brown, *Arkansas River Navigation System,* pp. 1, 15.

99. U.S. Congress, House, H.R. 13493, 91st Cong., 1970; ''Murray Lock and Dam,'' unpublished report, copy in File 2, Box 210, Records Management Office, Little Rock District.

100. U.S. Congress, Senate, S.B. 3063, 94th Cong., 1976; memorandum, Martha Jones for Senator McClellan, 4 June 1977, copy in McClellan Papers; ''Ozark-Jeta Taylor Lock and Dam,'' 26 May 1977, copy in File 2, Box 210, Records Management Office, Little Rock District. The Water Resources Development Act of 1986 renamed Lock and Dam No. 13 the James W. Trimble Lock and Dam, and Lock and Dam No. 9 the Arthur V. Ormand Lock and Dam. It named the reservoir created by Lock and Dam No. 9 Winthrop Rockefeller Lake, and Dam No. 2 the Wilbur D. Mills Dam. Despite the fact that these changes occurred after the cutoff date for this history, the new names are used here as an aid to future readers who will know the structures by these names.

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Notes

Chapter IX

1. David G. McNully to Bill Chappell, 6 May 1983, copy in Box 949, Administrative Files 401-402, 1983, Records Management Files, Little Rock District; *Arkansas Gazette,* 5 Mar. 1977; Little Rock and Tulsa Engineers Districts, *Guide to the McClellan-Kerr Navigation System,* p. 19; Clay, *Little Rock District,* p. 100; notes, provided by Shiela Ellis, Navigation Section, Little Rock District.

2. McNully to Chappell, 6 May 1983; Maynard interview; Steel interview; "Statement of Mr. George A. Morris, Arkansas River Navigation Project Public Hearing, 18 July 1957," unpublished typescript, copy in Box 209, Little Rock District; news release, 14 Jan. 1983, copy in Box 949, Administrative Files 401-402, 1983, Records Management Files, Little Rock District; U.S. Army Corps of Engineers, *McClellan-Kerr Arkansas River Navigation System* (n.p.: U.S. Army Corps of Engineers, n.d.).

3. See note 2 above.

4. Navigation Section, Little Rock District.

5. Robert E. Babcock et al., *Executive Summary; Environmental Effects of the Completed McClellan-Kerr Arkansas River Navigation System in Arkansas* (Springfield, VA: Institute for Water Resources, U.S. Army Corps of Engineers, 1980), p. 19; Albert Schaffer, Ruth C. Schaffer, Gary M. Holter, *Social Impacts of McClellan-Kerr Navigation System: A Study of Public Sector Response to Water Resource Development* (Springfield, VA: Institute for Water Resources, U.S. Army Corps of Engineers, 1981), p. 48.

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7. Circular Letter, G.B. Page to All Districts, 24 Apr. 1962, Box 864, Little Rock District Files.

8. Garner interview; Clay-Garner interview.

9. U.S. Congress, Senate, S.D. 97, 1962; Circular Letter, William M. Glasgow, Jr., 30 Nov. 1962, copy in Box 864, Little Rock District Files.

10. *U.S. Statutes at Large,* vol. 226, pp. 226-232.

11. Clay, *Little Rock District,* p. 100; Southwestern Division, *Water Resource Development in Arkansas 1981,* pp. 26-27; Little Rock District History Committee review comments.

12. U.S. Army Corps of Engineers, Southwestern Division, *Recent Developments in the McClellan-Kerr Arkansas River Navigation System* (Fort Belvoir, VA: U.S. Army Engineer Institute for Water Resources, 1977), pp. 112-113; Schaffer, Schaffer, and Holter, *Social Impacts of McClellan-Kerr Navigation System,* p. 1030; Bureau of Business and Economic Research, *Port Development,* p. 21.

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18. Schaffer, Schaffer, and Holter, *Social Impacts of McClellan-Kerr Navigation System,* pp. 5-13, 82.

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29. *Code of Federal Regulations,* file 36, chap. 8921.

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31. New Mattie Steamship—White River file in District Archeologist's File, Little Rock.

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35. *Arkansas Gazette,* 6 Mar. 1982; Interview, David W. Vannoy with Edward L. Nelson (Chief, Management Analysis Branch, Southwestern Division), Dallas, TX, 30 Sept. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Nelson interview).

36. Interview, David W. Vannoy with Major General Jerome B. Hilmes (Southwestern Division Engineer), Dallas, TX, 30 Sept. 1985, interview notes submitted to Little Rock District, 1987 (hereafter cited as Hilmes interview); telephone interview, author with Laura Brantley (first contract officer's authorized representative), 7 Jan. 1986, interview notes submitted to Little Rock District, 1987; verbal review comments, Judy Lester (Little Rock District Librarian) and Robert Dunn (Little Rock District Archeologist), 22 Dec. 1986; interview, author with Robert W. Whitehead (Little Rock District Engineer), Little Rock, 15 Oct. 1985, tape-recorded interview submitted to Little Rock District, 1987 (hereafter cited as Whitehead interview).

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42. Margaret Frick, "Dragline at Fourche Cut-Off," *Arkansas Democrat,* 11 June 1961.

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Notes

Appendix I

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3. Fine and Remington, *Corps of Engineers, p.* 5.

4. Cecil H. Wood, "The General Education Movement and the West Point Curriculum" (Ph.D. diss., Columbia University, 1951); John P. Lovell, "The Cadet Phase of the Professional Socialization of the West Pointer: Description, Analysis and Theoretical Refinement" (Ph.D. diss., University of Wisconsin, 1962); "Report of a Board of Army Officers and Distinguished Civilian Educators Appointed To Study the Curriculum of the U.S. Military Academy," 7 Nov. 1945, Letters Received, OCE, RG 77.

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7. Brigadier General Edgar, notation on first draft of this appendix, Sept. 1985.

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10. Edgar interview. Since that interview in July 1985, General Edgar has been given a new permanent assignment as commander of the South Atlantic Division of the Corps of Engineers.

11. Taylor, "Civil Works of the Corps of Engineers," p. 101.

12. "Thomas Henry Handbury," pp. 30-37; *Register of Graduates,* Entry 2057; Clay, *Little Rock District,* p. 7.

13. "Milton B. Adams," in USMA Assoc. of Grads, *Annual Report* (14 June 1910):73-77; *Register of Graduates,* Entry 2051.

14. "Henry S. Taber," in USMA Assoc. of Grads, *Annual Report* (12 June 1894):74-76; *Register of Graduates,* Entry 2469; Clay, *Little Rock District,* p. 9; Letter sequence, 1893-1894, in Entry No. 2947, Box 47, Series 98, RG 77.

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21. "William Durward Connor," in USMA Assoc. of Grads, *Assembly* (Fall 1960):71; *Register of Graduates,* Entry 3742.

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23. "Meriwether Lewis Walker," in USMA Assoc. of Grads, *Assembly* (n.d.):5-6; *Register of Graduates,* Entry 3514.

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29. *Arkansas Gazette,* 27 Jan. 1941; *Annual Report, 1900,* p. 2585; numerous letters to and from P.R. Van Frank in GAF, 1908-1928, RG 77, Fort Worth.

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31. Ibid., Entry 4351.

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34. "Brendon Burke Somervell," in USMA Assoc. of Grads, *Assembly* (Oct. 1955):63; *Register of Graduates,* Entry 5211; Reuss, *Memphis,* p. 4; Fine and Remington, *Corps of Engineers,* pp. 252-272.

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49. "Biographical Sketch—Colonel A.M. Jacoby," copy in District Engineer office files, Little Rock District; *Register of Graduates,* Entry 10473.

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Notes

Appendix II

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3. "Robert L. Baird," inactive personnel, Records Management; Baird interview; Clay, *Little Rock District,* p. 95.

4. "Robert G. Barbour," inactive personnel, Records Management; telephone interview, David W. Vannoy with Robert G. Barbour, 15 Oct. 1985.

5. "Erwin D. Blakney," inactive personnel, Records Management; Robert G. Barbour to Selection Committee, 30 May 1975, copy in Personnel Office, Little Rock District, Corps of Engineers, Little Rock.

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8. "Howard C. Farison," inactive personnel, Records Management.

9. "William K. Finefield," inactive personnel, Records Management.

10. "Nomination of Hugh C. Getty for Gallery of Distinguished Civilian Employees," copy in Personnel Office, Little Rock District, Corps of Engineers, Little Rock.

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Index

A

Abert, Sylvanus Thayer 29, 32
Adams, John Quincy 14
Adams, Maj. Milton B. 28, 31, **110**
Adams, Paul E. **125**
Adams Airfield 70
Albright, Gus 76, 77
Albuquerque District 63, 84, 98
Allen, Charles J. 19
Allen, William J. 76
American Revolution 6
American Settlements **7**
Antiquities Act 1906 ..... 49, 100
Appalachian Act 1965 86
Appalachian Mountains 1, 6
Apple, W.M. "Bill" 76, 77
Archaeology and Historical Preservation Act 1974 100
Archaic People **3**
Archimedes, snag boat 16
Area Development Administration Act 1961 86
Arkansas Democrat 76
Arkansas District 6
Arkansas Gazette 39
Arkansas Post, AR (also Fort Charles III) 5-8, 10, 12, 82, 84, 87, 89,
Arkansas Post Canal 51, 88, 89, 94
Arkansas River **1**, 3-11, 13-23, 25, 28-32, 34-36, 39, 40, 42, 43, 45, 49, 51-53, 55, 57, 63, 80-90, 96-98, 102
Arkansas River Basin 1, 12, 19, 29, 30, 32, 35, 45, 50, 51, 53, 55, 63, 75, 80-82, 85, 86, 97, 101, 106
Arkansas River Development Corporation 97
Arkansas River Improvement Association 41
Arkansas River Valley 3, 4, 7, 11, 32, 49, 97, 98
Arkansas Territory 10
Arkansas Traveler, barge 89
Arkansas-White River Basin Act 1943 63
Arkansas-White-Red Basins Interagency Committee 84, 85
Army Airfield Construction **60**
Arthur V. Ormond 89, 93
Atchafalaya River 48
Austin, Stephen F. 14
Aztecs 3, 4

B

Baird, Robert L. "Shorty" **126**
Bane, Col. Frank P. 89, 91, **122**
Barbour, Robert G. **126**
Barksdale Airfield 60, 70
Barren River 33
Batesville 32, 33, 36, 51
Battle of New Orleans 14
Battle of Pea Ridge 18, 49
Battle of Vicksburg 18
Baxter, Elisha 21
Bay River 25, 28
Beauregard, P.G.T. 18
Beaver Dam and Reservoir 79, 80, 87
Beaver Lake 80, 103, 105
Bell Foley 78
Benyaurd, Maj. William Henry Harrison 20-22, 25, 30
Black River 1, 19, 21, 29-31, 49, 50-52, 67, 79, 102, 104
Blackburn Reservoir 82, 84
Blakney, Erwin D. 55, **126**
Blue Mountain Dam and Reservoir 56-58, 67, 76, 77, 84, 86, 102

Blue Mountain Lake 105, 107
Bluff Dwellers 3
Blytheville 60, 101
Board of Engineers for Rivers and Harbors 36, 81-84
Bonine, Lt. Col. Larry S. **123**
Boston Mountains 1, 48
Boyd Point Levee 41
Bozarth, Harry G. **127**
Brown, Lt. Thompson Skinner 16, 29, 30
Brown, Maj. Gen. Lytle 50
Brown, Col. Stanton L. **120**
Browning, Imogene W. **127**
Bruce, John 14
Bryan, William H. 30
Buffalo District 98, 100
Buffalo River 68, 77-79, 102
Buffalo Shoals 21, 30, 103
Bull Shoals Dam and Reservoir 33, 57, 59, 67, 68, 70, 73, 75-78, 102
Bull Shoals Lake 68, 72-74, 103
Bumpers, Gov. Dale 97
Burdick, Col. Roy D. **118**
Burns, Col. William C. 78, **122**
Burr, Aaron 7
Burton, Theodore E. 36
Byrnes, Clarence 51

C

Cache River 19, 25, 29, 38, 48
Caddo Civilizations 3, **4**, 5
Caddoa Reservoir 56
Calhoun, John C. 9, 13
Camp Beaureguard, LA 62
Camp Chaffee, AR 62
Camp Pike, AR 62
Camp Robinson, AR 61, 62, 101
Canadian River 4, 10, 82, 84
Cantonment Division 10
Canton Reservoir 84
Caraway, Sen. Thaddeus H. 43
Carlson, Arthur 70
Carter, Jimmy 13, 64, 98, 101, 105
Cassidy, Lt. Gen. William F. 78
Caudle, Reece 51
Cavelier, Rene-Robert 5
C.B. Reese, snag boat 21, 28
Cherokee Indian Tribe 9, 14
Chicago District 98
Chickasaw Indian Tribe 14
Choctaw Indian Tribe 9, 14
Chorpening, Brig. Gen. Claude H. 85
Cimarron River 82, 84
Civil War 19, 21, 29, 35, 64, 106
Clairborne, W.C.C. 7
Clark, George Rogers 6
Clarke, Lt. Gen. Frederick J. 99
Clarke, Sen. James P. 40
Clay, Henry 13
Clean Water Act 1972 100
Clearwater Dam and Reservoir 56, 57, 59, 63, 67, 74, 76, 77, 104
Clema, Col. Joe A. **115**
Comet, steamboat 12
Colorado River 45
Company of the Indies 5
Compromise of 1877 21
Compton, Neal 77
Conchos Dam and Reservoir 56
Conchos District (formerly Tucumari District) 56
Confederate States Engineer Corps 18
Connolly, Donald H. 46
Connor, Capt. William D. 42
Contraction Works **16**
Coolidge, Calvin 46, 49
Cossatot River 1, 3
Country Gentleman 84
Couture, Jean 5
Cravens, Fadjo 82
Creek Indian Tribe 14
Current River 19, 25, 29, 31, 42, 51
Curtis, Maj. Gen. Samuel R. 18
Cypress River 21

D

Daily Graphic 40
Daily Oklahoman 84
Dalrymple, Maj. Gen. John C. 87, **121**
Dalton Period **3**
Dams, concrete-capped **33**
Dardanelle, Arkansas 4, 32, 36, 41, 101
Dardanelle Dam and Reservoir 82, 85, 87-90, 94, 105
Dardanelle Lake 80, 105
Dardanelle Lock and Dam 85-88, 92, 94
David D. Terry Dam 89, 91, 96
David D. Terry Lock (see Lock and Dam No. 6) **87**, 89, 94
Davis, Jefferson 16
Davis, William Arthur Jr. **118**
De Champlain, Samuel 4, 5
De La Tour, Sieur La Blond 6
De Soto, Hernando 4, 5
De Tonti, Henri 5
De Vauban, Marquis 6
Deck Barge **95**
Deep Fork River 82
Denison Dam and Reservoir 56
Denison District 56
Dent, Maj. Elliot J. 43, 50, 64, **114**
DeQueen Lake 80, 99
Desha County 1
Dierks Lake 80, 99
Dikes **21-23**
Dillingham, Capt. John K. 17
Dipper Dredges **15**, 28, 102
Dondero, Rep. George A. 82-85
Douglas, Col. Henry T. 18
Douglas, William O. 78
Dredging 15, 28, 102

Dumas, patrol boat 89

E

Eagle, steamboat 12
Early Archaic 3
Economies Act 1932 106
Edgar, Brig. Gen. C. Ernest III 109, **123**
Eisenhower, Dwight D. 83-85
Eleven Point River 77, 78
Enterprize, steamboat 14
Epps, Tom 72
Eufaula Dam and Reservoir 84-86

F

Farison, Howard C. **127**
Faubus, Gov. Orval 78
Faulkner Lake 98
Federal Power Commission 45, 58, 74, 82, 84
Federal Water Pollution Control Act 1972 ..... 97, 99
Federal Water Project Recreation Act 1965 ..... 97, 99
Fillmore, Millard 16, 18
Finefield, William Kelly **127**
Fish and Wildlife Coordination Act 1958 ..... 75, 76
Fitch, Capt. Graham D. 39, 41, 42, **112**
Flatboats **11**, **12**, 21, 23
Flood Control Acts
1917 ..... 38, 43, 53
1928 ..... 48, 53, 59
1936 ..... 45, 53, 55, 56, 72, 81, 106
1938 ..... 55, 81, 83
1941 59
1944 ..... 64, 75
1950 ..... 84, 86
1960 ..... 97, 99
Floods
1898 ..... 32, 33, 36, 39
1903 39
1908 ..... 39, 40
1912 ..... 41, 42
1913 42
1916 ..... 43, **45**, 46
1927 ..... **45**, 51, 53
1935 51
1937 53
1943 63
1944 ..... 63, 64, 76
1945 63
1973 106
1974 106
1976 105
1977 105
1982 106
Fort Bellefontaine, MO 8
Fort Chaffee, AR 62, 101, 103
Fort Charles III, AR (also Arkansas Post) 6
Fort Gibson, OK 12, 15, 19, 32, 84
Fort Gibson Reservoir 82, 86
Fort Peck, MT 55, 58
Fort Peck Dam 50
Fort Smith, Arkansas 1, 4, 10, 12, 17, 18, 21, 22, 28-32, 35, 36, 41, 51, 62, 63, 86, 91, 92
Fort Supply Reservoir 56
Fort Worth District 72, 87, 89, 99, 101
Fourche LaFave River 1, 19, 21, 25, 51, 57
Fourche LaFave Valley 102, 104
French inland power **4**
French Royal Corps of Engineers 6
Fulbright, Sen. J. William 61, 81, 83, 98, 100

G

Galloway, Col. Gerald E. **119**
Galveston District 63
Garner, Carl 104
General Dam Act 1906 37
General Survey Act 1824 ..... 13, 16, 26
Gentleman of Elvas 4
Getty, Hugh C. **127**
Gibbons v. Ogden case 13
Gilbert Dam 78
Gilded Age 19, 26, 36, 38
Gillham Lake 80, 101
Graham, N.R. "Newt" 51, 69, 81, 83
Grand Osage River 8
Grand River 8, 15, 29, 39, 43
Grand River Basin 81, 82, 83, 84
Grant, Ulysses S. 18, 21
Great Arkansas Cleanup **104**
Great Depression 50, 69
Great Lakes Basin 4
Great Raft 14
Great Sand Bar 10
Great Salt Plains Reservoir 56
Green River 33
Greer, Clinton M. **128**
Greers Ferry Dam and Reservoir 59, 74, 76-78, 81, 87, 89, 90, 97, 102-105
Greers Ferry Lake 77, 80, 104, 105
Groves, Richard 104
Gulf of California 5
Gulf of Mexico 1, 4, 5, 32, 45, 46, 48
Gulf of Mexico Division 63

H

Hall, Gov. David 97
Halleck, Henry 18
Hammerschmidt, John Paul 78
Handbury, Capt. Thomas Henry 25-31, 33, 34, 107, **110**
Harris, Rep. Oren 61, 81, 82
Hart, R.P. 82
Hayes, Rutherford B. 21

Hays, Brooks 82
Heliopolis, snag boat 14, 16, 17
Historic Sites Act 1935 ..... 75, 100
Hodges, Maj. John N. **115**
Hoge, Maj. William M. **116**
Holloway, J.B. 79, 84
Holmer, Col. Hans William **119**
Hoover, Herbert 46, 50, 83, 98
Hopkins, Harry 56
Hopper Barge **95**
House Resolution 308 ..... 45, 48, 52, 59
House Resolution 345 ..... 45, 52
Houston, John 77
Howell, Lt. Col. George P. 43
Howell, Maj. R.P. **115**
Huber, Walter L. 84
Hudson Bay 5
Hulah Reservoir 56
Hurley, Patrick J. 50
Hydroelectric Power **37-39**, 45, 81, 104

I

Ickes, Harold L. 51
Illinois and Mississippi Canal 33
Illinois Country 5, 6
Illinois River 82
Indian Removal Act 1830 14
Indian Territory 7, 9, 12, 13, 15, 19, 29, 32, 41
Intergovernmental Cooperation Act 1968 106
Itschner, Maj. Gen. Emerson C. 76, 96

J

J.C. Murray Dam 92, 94, 97, 106
J.N. Macomb snag boat 20
J.R. Meigs snag boat 21, 28
Jackson, Andrew 14, 16
Jacksonport 30, 33
Jack Murray Lock and Dam 90, 92, 94, 104
Jacoby, Arthur M. 76, **121**
Jadwin, Maj. Gen. Edgar 46, 48, 50
Jadwin Plan 46, 48, 51-53
James, Opal L. 107
James W. Trimble Dam 89, 91
James W. Trimble Lock (see Lock and Dam No. 13) **87**, 90, 91
Java, steamboat 16
Jefferson, Thomas 7, 9
Johnson, Lyndon B. 98
Johnston, Joseph E. 18
Joliet, Louis 5
Jones-Kirby Port 90

K

Kealer, Louis O.D. 105
Keelboats **12**
Kennedy, John F. 77, 86, 97
Keokuk Lock and Dam 38
Kern, Col. Thomas F. 57, **118**
Kerr, Gov. Robert S. 81, 85
Kerry, Cleveland **128**
Keystone Dam and Reservoir 84-86
Knowlton Levee 46
Know-Nothing, steamboat 17
Koons, H.L. 29
Korean War **70**, 71-73, 83

L

Lane, Col. Thomas A. **119**
L'Anguille River 19, 21, 25, 42
La Salle, Sieur de 5
Lake Langhofer 90
Lake Taneycomo 73, 75
Lake Texoma 99
Laney, Gov. Ben T. 81, 83
Law, John 5, 6
Lee, Robert E. 18
Lighter Aboard Ship (LASH) Barge **95**
Little Red River 1, 51, 74, 76
Little Red River Basin 74
Little River **3**, 99
Little River Basin 1, 3, 80
Little Rock, Arkansas 4, 9, 10, 12, 13, 16-19, 21-23, 26, 29-32, 34-36, 39, 42, 45, 51, 52, 55, 82, 89, 90, 92, 104
Little Rock District **1**, 3, 7-10, 14, 17, 21, 23, 25, 26, 31, 36, 39, 40-42, 44, 45, 48, 53, 55-57, 60, 61, 63, 67, 68, 70, 72-77, 79, 80, 81, 83-88, 90, 92, 94-99, 101-103, 105-108
Lizette, quarterboat 32
Lock and Dam No. 1 (Norrell Lock) 36, 41, 43, 87, **89**, 94, 102
Lock and Dam No. 2 (Wilbur D. Mills) 39, 41, 43, 86, 88, **89**, 102
Lock and Dam No. 3 ..... 39, 41, 43, 86, 87, 89, 91
Lock and Dam No. 4 ..... 86, 87, 89, 91, 102
Lock and Dam No. 5 ..... 86, 87, 89
Lock and Dam No. 6 (David D. Terry)..... **87**, 89, 94
Lock and Dam No. 7 (Jack C. Murray) **87**, 90, 94
Lock and Dam No. 8 (Toad Suck Ferry).... **87**, 91, 92, 94
Lock and Dam No. 9 (Arthur V. Ormond)..... 87, 91
Lock and Dam No. 10 (Dardanelle) **87**, 94
Lock and Dam No. 11 ..... 87, 88
Lock and Dam No. 12 (Ozark-Jeta Taylor) **87**, 88, 94
Lock and Dam No. 13 (James W. Trimble) 86, **87**, 90, 91
Lock and Dam procedures **133**
Lone Rock Dam project 77, 78
Long, Brevet Maj. Stephen Harriman **9**, 10, 11, 13, 14, 16, 107
Louisiana District 7

Louisiana Purchase 1803 ..... 7, 9
Louisiana Territory 6-9
Lukesh, Capt. Gustave R. 40, 41, **113**

M

Macomb, Maj. Gen. Alexander 13, 14
Macomb, Col. John N. **19**, 20, 29
Maid of Orleans, steamboat 12
Mannford Reservoir 82, 84
Mansfield, Mike 82
Many, Lt. James B. 7
Markham, Lt. Gen. Edward M. (also Maj. Gen.) 55, **114**
Markham Ferry Reservoir 82, 86
Marquette, Father Jacques 5
Marshall, John 13, 40
Marshall, Brig. Gen. William L. 40
Marshall Mountain Wave 77
Martin, Earl R. 55
Martin, Roberta C. 55
Massard Prairie Training Camp, AR 62
Masters, Jessie **128**
Maynard, Col. Charles D. 79, 87-90, **121**
McClellan, George P. 18
McClellan, John L. 61, 63, 64, 82, 83, 89, 94, 98
McClellan-Kerr Arkansas River Navigation System 1, 80, 81, 83, 90, 94, **95**, 96, 98, 101-104, 107
McGregor, Lt. Robert **112**
McKenzie, Maj. Gen. Alexander 41, 42
McKinney, Harold C. **129**
McPherson, James B. 18
Meade, George 18
Membre, Father Zenobius 5
Memphis District 41-46, 55-57, 59, 84
Mexican War 16
Miller, Rep. John E. 51, 52
Miller, Mickey 60
Mills, Rep. Wilbur D. 61, 76, 94
Mills Lock (see Lock and Dam No. 2) **89**
Millwood Lake 74, 80, 99
Mississippi Bubble 5, 6
Mississippi Company 3, 4
Mississippi River 1, 4, 5, 7-9, 12-22, 25, 28, 29, 33, 35, 38, 39, 41, 43, 45, 46, 48, 50, 53, 82, 86, 89, 107
Mississippi River Basin 6, 8, 12, 45, 51
Mississippi River Commission 25, 32, 43, 45, 46, 48, 51
Mississippi River Valley 3, 6, 43, 45
Mississippi Territory 7
Missouri Compromise 1820 10
Missouri River 9, 10, 19, 20, 23, 50, 80, 95
Moline Lock 13, 33
Monroe, James 9, 13
Monroney, Rep. A.S. "Mike" 82, 83
Morrow, John P. Sr. 51
Moss-Bennet Act 100
Mount Magazine 67
Mountain Home, Arkansas **68**, 69, 70, 73, 77, 101
Murray, J.C. "Jack" 51, 82, 84, 94
Murray Lock (see also Lock and Dam No. 7) **87**, 90, 92, 94
Muscle Shoals 38

N

National Defense Act 1920 43
National Environmental Policy Act 1969 ..... 98, 99, 100
National Environmental Protection Act 1969 ..... 75, 76
National Historic Preservation Act 1966 ..... 100, 101
National Park Service **75**
Native Americans 5, 6
Neilson, Col. A.M. **118**
Nesho, steamboat 17
Newcomer, Capt. Henry Clay **111**
New Deal 50, 51, 56, 75, 76, 86
New England District 98
New Frontier Program 86, 87
New Madrid Earthquake 8
New Orleans District 84
New River case 59
New York Times 76
Nike-Hercules missile site 71
Nimrod Dam and Reservoir 56, 57, 58, 59, 67, 72, 74, 76 77, 86, 102
Nimrod Lake 102, 105
Nixon, Richard M. 94, 98, 100
Noce, Maj. Daniel **117**
Norfork Dam and Reservoir 56, 61, 72, 74, 76, 78, 80, 102, 103
Norfork Lake 74, 103
Norfork Project 52, 58, 75, 77
Norrell, Rep. W.F. 82, 94, 96
Norrell Dam 1, 89, 91, 104
Norrell Lock (see also Lock and Dam No. 1) **89**, 94, 102
North Canadian River 82
North Fork River 1, 58, 74, 75

O

Ohio River 9, 14, 16, 17, 20, 38, 41, 48, 53, 81, 83, 91
Old River 48
Oologah Reservoir 82, 85, 86
Operation Pork Barrel 19, 85
Optima Reservoir 84
Ormond, Arthur V. 51
Osage Indians 8
Ouachita River 18
Quachita Mountains **1**, 3, 48, 57
Overton, Sen. John H. 82
Overton Act 1936 53

Ozark-Jeta Taylor Dam 89, 94, 96, 92, 103, 105
Ozark-Jeta Taylor Lock (see also Lock and Dam No. 12) 92, 94, 103
Ozark Reservoir 82, 101
Ozarks Mountains **1**, 3, 4, 48, 57, 58, 67, 69, 77

P

Paleo-Indians 3
Palfrey, Capt. Carl 32, **111**
Panama Canal 33
Panther Bay 70
Parke, Lt. Col. John G. 27, 28
Parkin, William 40
Pasink, Dora 55
Peach Orchard Bluff 55
Pearl Harbor 61
Pendleton Act 26
Pensacola Reservoir 86
Peterson, Elmer 84
Peterson, Hugh 81, 82
Petit Jean River 1, 19, 67, 102, 104
Pick, Lt. Gen. Lewis A. 84
Pierce, Dewey 55
Pierce, Franklin 16
Pike, Lt. Zebulon Montgomery 7, 8
Pilcher, William E. **129**
Pine Bluff, Arkansas 22, 23, 26, 30-32, 35, 36, 39, 41, 45, 49, 51, 55, 86, 87 89, 102
Pine Bluff Arsenal 31, 32, 35, **63**, 70, 101
Plains Indians 15
Platte River 10
Port of Catoosa 92, 94
Port of Dardanelle 92
Port of Fort Smith **90**, 91
Port of Little Rock 89, **90**
Port of Muskogee 94
Port of Pine Bluff 89, **90**
Poteau River 82
Potter, Capt. Charles L. **112**
Prentiss, Col. Lewis W. 84
Price, Gen. Sterling 18
Public Works Administration 51, 52
Putnam, Capt. Alfred B. **114**

Q

Quapaw (Arkansas Indians) 5, 9
Quartermaster Corps 10, 42, 44, 50, 56, 57, 61-63

R

Randels, Col. Dale K. **123**
Randolph, Isham G. 36
Rankin, John E. 81, 82
Raynolds, Lt. Col. William F. 19
Ralphe, Wendell W. **129**
Reagan, Ronald W. 101, 106
Reclamation Act 37
Reclamation Service 37-39
Reconstruction Period 21, 29
Red River 3, 4, 8, 9, 10 13, 14, 18
Red River Basin 56, 85, 99
Red River Campaign 18, 85
Reno, Sieur Remy 6
Reservoir Salvage Act 1960 ..... 76, 100, 102
Revetments 15, **16**, 17, 22, 23, 39, 46, 88
Reybold, Lt. Gen. Eugene (also Lt. Col.) 52, 53, 55, 61, 63, 81, 82, **117**
Rhodes, Capt. Lester 55
Rich, Robert T. 85
Riley, Lt. Gov. Bob 92
Rio Grande River 16
Rivers and Harbors Act
1824 ..... 13, 14
1828 13
1832 15
1842 16
1843 16
1844 16
1852 16
1866 19
1868 19
1871 19
1873 19
1874 19
1890 ..... 19, 33
1899 ..... 19, 35, 36, 51 55, 56
1909 38
1916 ..... 42, 43
1925 45
1927 45
1935 52
1946 83
1950 84
1965 106
Robert Thompson, steamboat 12
Robertson, Sen. Edward 82
Robinson, Sen. Joseph T. 51
Rockaway Beach 73
Rock City, steamboat 17
Rock Island District .....
Rocky Mountains (the Rockies) 1, 5, 8, 10
Rogers, Will 94
Rolling Fork River 1, 3
Roosevelt, Franklin 50, 51, 53, 55-57, 61
Roosevelt, Theodore 36, 37, 38, 45, 49
Russell, Capt. John W. **17**, 20, 21
Russellville Railroad 92
Rutt, Edward Francis **130**

S

Sabine River 9, 10
Sacramento River 38, 43
Saline River 1, 3, 19, 21, 25

Sanders, Emmett 51, 83, 84
Savannah River 5
Schley, Lt. Gen. Julian L. 61
Schmand, Delbert A. **130**
Scott, Gen. Winfield 13
Scott, Lt. Col. Stanley L. 117
Seabee Barge **95**, 97
Seeman, Brig. Gen. Lyle E. 87
Seminole Indian Tribe 14
Senate Document 97 97
Settlers, First **3**
Sherman, Lincoln F. **130**
Short Mountain Reservoir 84
Shields, E.M. 20
Shreve, Capt. Henry M. 14, 16, 17, 20, 28, 29
Sibert, Lt. William L. 28, 32, 33, 35, 36, **111**
Sidio, Maj. Jerome B. 109
Sims, Flournoy W. "Nippy" **131**
Slocum, Harry 67
Small, Gov. David 105
Smith, Maj. Clark Stull 41, **113**
Snag Boat 14, 16, 17, 20, 21, 27, 28
Snagging 15, **27**, 28, 29 32, 44
Snyder, W.H.S. 55
Somervell, Maj. Gen. Brehon B. (also Col.) 49, 60, **118**
Southern Pacific Railroad 90
Southwestern Division 45, 53, 56, 62, 63, 72, 75, 76, 84, 86, 97, 99, 101, 105
Spanish Settlers **4**, **6**
Spanish-American War 35
St. Francis River 19, 21, 25, 28, 29, 42, 52
St. Lawrence River 5
Steamboat **12**, 17, 41, 42 46, 92
Steel, Col. Charles L. 89, 92, **122**
Steele, Gen. Frederick 18, 89
Stigler, William G. 82
Stiles, Joe 48
Stimson, Henry L. 61
Stockman, David 101
Story, Jesse W. "Bill" **131**
Strawberry River 77
Sturgis, Lt. Gen. Samuel D. 85
Stuttgart 60
Stuttgart Airfield 60
Suter, Capt. Charles Russell 19, 23, 25, 27-31
Swift, Col. Joseph Gardner 9

T

Taber, Capt. Henry S. 27, 29-33, 35, 36, 39, 107, **110**
Table Rock Dam and Reservoir 52 59, 72, 75, 76, 77-79, 105, 107
Table Rock Lake 73-75, 80, 105
Taft, Charles E. 32, 103-105
Taft, William H. 42, 43
Taft Reservoir 82, 84
Tallmadge, Rep. James Jr. 10
Tank Barge **95**
Taylor, Maj. Gen. Harry **110**
Tenkiller Ferry Reservoir 82, 86
Tennessee River 5, 38, 51
Tennessee Valley Authority 51, 64, 88
Terry, Rep. David D. 51, 52, 81, 94
Tenton Dam 105
Thatcher, H.K. 82
The National Resources Defense Council v. Calloway case 98
Thompson, Robert 12
308 Studies 33, 35, 36, 39, 42, 43, 45, **48**, 49-53, 55, 57, 59, 68, 73, 75, 76, 77, 83, 84, 88, 90, 96, 101, 102, 104
Titan II 71, 72
Toad Suck Ferry Dam 89, 93, 94, 96
Toad Suck Ferry Lock (see Lock and Dam No. 8) **87**, 91, 92, 94
Tooney, Mayor W.L. 41
Topographical Corps 14, **16**, 17, 18, 27
Treaty of Fontainebleau 1762 6
Treaty of San Ildefonso 1800 7
Trimble, James W. 61, 78, 79
Trimble Lock (see Lock and Dam No. 13) **87**
Truesdale, Capt. 17
Truman, Harry S. 14, 16, 67, 70, 72, 73, 85-87
Tucumcari, Nex Mexico (District) 56
Tulsa District 56, 61, 63, 84, 86, 99, 101
Turner, Jessie 87
Tyler, John 14, 16, 17
Tyson, Capt. Abraham 17

U

Union Pacific Railroad 42, 90, 92
U.S. Department of Energy 64
U.S. Department of Health, Education and Welfare 70
U.S. Department of the Interior 4, 37, 38, 44, 50, 64, 84
U.S. Environmental Protection Agency 97, 106
U.S. Fish and Wildlife 74, 76, 77, 97
U.S. Forest Service 37, 44, 106
U.S. Geological Survey 37

V

Van Buren, Martin 14, 16, 17
Van Dorn, Gen. Earl 18
Van Frank, Phillip R. 43, 49, **115**
Vaugine Neck Levee 40, 41
Verdigris River 81, 82, 86

Vicksburg District 61, 84, 86
Vietnam War 98
V-J Day 64, 81
Vogel, Brig. Gen. Herbert D. 84

W

Walker, Maj. Meriwether Lewis 41, 42, **113**
Walnut River 50
War Department 14, 40-42, 49, 51, 60, 61
War of 1812 8
Washington Aqueduct 27
Washita River 84, 86
Water Resources Development Act 1976 104
Water Valley Dam 77, 78, 79
Waterways Experiment Station 85, 87, 101, 103, 109
Webbers Falls Reservoir 82, 84
Weinert, Col. Donald G. **123**
Welch, Thomas 5
West, Herman C. 55, **131**
Western River Improvements Office 14, 16, 19, 20, 21, 25, 29
Whitehead, Col. Robert W. "Wayne" 110, **124**
White River **1**, 4, 6-8, 12, 19, 21, 22, 25, 28, 29, 30, 32-36, 41-43, 45, 49, 51-53, 55, 57, 59, 67, 72, 74, 75, 81, 82, 88, 89, 100, 103, 107
White River Basin 1, **3**, 29, 33, 35, 46, 49, 50, 53, 55, 58, 59, 72, 85, 92
White River Basin Flood Control Plan 59, 77
Wilbur D. Mills Dam 89, 91, 102
Wilby, Col. Francis B. **116**
Wilcox Act 1941 60
Wild and Scenic Rivers Act 1968 78
Wild Cat Shoals Dam 59
Wilkinson, Lt. James B. 7, 11
Wilkinson, Maj. Gen. James 7, 8
Williamson, Gen. Thomas T. 14
Wilson Dam 38
Wilson Dam Project 51
Wilson River Basin 21, 25, 29
Witchita, snag boat 28
Woodring, Harry 55
Works Progress Administration 56, 57, 106
World War I 38, 42, 50, 62, 69, 73, 74, 98
World War II 60-64, 69, 70-72, 75, 76, 81, 83, 98, 101, 103, 107

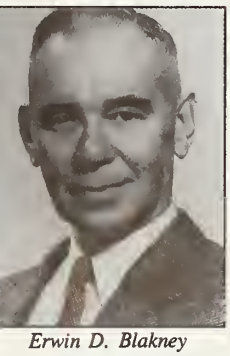
X, Y, Z

Yazoo River 21
Yellowstone Geyser 75
Yell's Bend 22, 23

Paul E. Adams
1935-1971

Robert L. "Shorty" Baird
1927-1970

Robert G. Barbour
1929-1976



Erwin D. Blakney
1919-1958

Harry G. Bozarth
1926-1971

Imogene W. Browning
1938-1970

Howard C. Farison
1937-1976

William Kelly Finefield
1936-1973

Hugh C. Getty
1942-1980

Clinton M. Greer
1932-1960

Cleveland F. Kerry
1950-1981

Jesse Newton Masters
1958-1981

Harold C. McKinney
1933-1963

William E. Pilcher
1922-1963

Homer A. Rabjohn
1950-1980

Wendell W. Ralphe
1930-1971

Edward Francis Rutt
1929-1971

Delbert A. Schmand
1938-1974

Lincoln F. Sherman
1927-1963

Flournoy W. "Nippy" Sims
1938-1964

Jesse W. "Bill" Story
1941-1977

Herman Clay West
1932-1969

US Army Corps
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Little Rock District